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Efficiency, Fairness and Sustainability in Social Housing Policy and Projects

Edited by
Grazia Napoli and Maria Rosa Trovato

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About the Editors

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Preface to "Efficiency, Fairness and Sustainability in Social Housing Policy and Projects"

The provision of affordable housing for low-income households is a very complex issue that has long been debated in many countries around the world. Social housing (SH) is one of the tools for achieving fairness, social sustainability, and economic feasibility, and it is interrelated with politics, ethics, and economics, as well as the environment, architecture, and technology. In other words, national and local policies, as well as public and private financial resources, are needed to provide SH.

SH also involves social and urban transformations and is, consequently, linked to urban planning and redevelopment projects, real estate market dynamics, and cooperation between public and private stakeholders. Furthermore, decision-making on SH policies and projects has to be supported by assessments of economic feasibility and social and environmental sustainability.

This volume presents studies on various topics to recompose the multi-faceted subjects of social housing within a unified framework.

To provide affordable housing, SH projects have to achieve efficiency and economic feasibility while meeting several constraints, so the trade-off between the price of developable areas and housing affordability is a very common problem in many cities. A study conducted in northeastern Italy proposes a financial model to achieve both social and economic goals through various scenarios and variables, such as the cost of construction work and household income. Other projects must resolve the trade-off between maximizing SH share and minimizing public financial contribution in public–private partnerships (PPPs). An evaluation model can support the decision-making process of urban regeneration projects by also considering economic constraints, such as local real estate market prices and financial feasibility for the developer.

Social housing projects aim to achieve greater fairness, although public regulations can sometimes cause negative effects. To achieve the goal of social sustainability, SH rents must be below market rents and low enough to be affordable for low-income households. A study examines, for example, an Italian law that sets the rent of SH units according to benchmark rents based on local agreements between landlords and renters' associations. The results show that this rule generates significant inequalities and spatial asymmetries within and between cities.

To facilitate economic development, urban planning promotes the construction of road infrastructure, but these projects result in negative social effects when citizens are forced to relocate. A group of researchers proposes a multi-parameter model to assess fair compensation and indemnification and to ensure social protection and financial support for owners and tenants affected by the expropriation of their housing units.

Another relevant issue connected to SH concerns outward regeneration effects in neighborhood-based projects. One study focuses on a conceptual framework useful for qualitative analysis to evaluate future urban regeneration projects, such as public housing districts, that induce environmental and quality-of-life improvements in a broader urban context.

SH is also deeply related to the Sustainable Development Goals (SDGs), although the social dimension of sustainability has been insufficiently explored. To support the creation of inclusive cities and communities, urban projects should be based strictly on social needs. One paper proposes a multi-methodological approach based on combining stakeholder analysis with a particular type of Social Multi-Criteria Evaluation to include the preferences of all stakeholders in the final evaluation.

Other researchers have analyzed how national housing policy or policy strategies can guarantee housing affordability for low-income households. A study conducted in Malaysia identifies multiple reasons why this expected goal has not been met, such as low household incomes; high land prices, construction costs, and compliance costs; mismatch of supply and demand; and ineffective housing planning. Moreover, policy strategies are not always able to translate into affordable housing development and housing affordability for low-income earners, as is the case in Nigeria.

The evolution of social housing policies within the Saudi Arabian context demonstrates that the institutional response in the social housing sector has changed over the years and that in recent times there has been a shift from a public-welfare perspective to a more neoliberal outlook, with the need to adopt specific protocols for working with nongovernmental actors.

Other studies have found that several sociocultural factors influence social housing. Despite the general improvement in housing, according to a study in Mumbai, India, community acceptance of social housing versus slums remain low, due to some related negative effects, such as the change in location and job induced by moving to social housing. In addition, a potential increase in demand for Social Housing may result from the income conditions of some social groups. A survey conducted in South Korea explores the situation of young tenants who live on their own and receive financial support from their parents to pay current housing expenses. It found that a large percentage of young people potentially need this kind of support and that the main explanatory variables are age and income, residential location, and rental deposit. Consequently, the provision of social housing should be expanded to meet young people's need for independent living.

Grazia Napoli and Maria Rosa Trovato
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Article

Affordable Housing vs. Urban Land Rent in Widespread Settlement Areas

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Abstract: Social housing constitutes a partial response to the demand for affordable housing. In Europe, there are different forms of social housing, which are distinguishable based on whether they employ a universal or residual approach. The latter is employed by Italian initiatives for social residential construction, the financial instrument of which is the Investment Fund for Housing, a closed-end fund managed by CDP (Cassa Depositi e Prestiti) Investment, which provides public–private partnerships. The main obstacle to the supply of low-cost houses is the high cost of building areas or, in other words, the high urban land rent. The value of building areas is particularly high in urban areas and in widespread settlement areas, for instance, in Northeastern Italy. The main objective of this paper is to identify the trade-off between urban land rent and housing affordability in a social housing intervention in Pordenone (Northeastern Italy). Four different scenarios are developed, the variables of which are: Cost of the area (urban rent), cost of construction works (quality of the buildings), and household income distribution. The results show that achieving the economic and social objectives of a social housing investment simultaneously is not possible in any of the scenarios evaluated. To allow the social groups most in need to access affordable housing would require a reduction of approximately 30% of the estimated cost of a building area.

Keywords: social housing; urban rent; affordable prices; discounted cash flow analysis

1. Introduction

Social housing constitutes a partial answer to the demand for low-cost housing. In Europe, there are various forms of social housing, which are distinguishable based on whether they employ a universal approach—in which the State guarantees the right to housing, and Social Housing acts as a calmer of the market—or a residual approach—in which the State intervenes to compensate for market failures. The latter approach includes national initiatives for social residential building, the financial instrument of which is, in Italy, the Fondo Investimenti per l'Abitare (FIA), a closed-end real estate fund managed by CDP (Cassa Depositi e Prestiti) Investment Sgr, which provides for public and private partnerships.

One of the most relevant and critical aspects of social impact investing (SII) operations concerns the measurement of social impact [1,2], defined as "the portion of the total outcome that occurred as a direct result of the intervention, i.e., not including that part that would have taken place equally without the intervention" [3].

Social housing can be traced back to the so-called affordable housing approach. This approach was widespread in Europe, the USA, Canada, and Australia in the 1980s and requires that the satisfaction of housing needs does not affect a person's ability to meet other basic needs, such as food and health

care. Often, an inadequate supply of affordable houses causes spatial segregation for low-income households [4].

In all settlement processes, and thus also in those with a social value, the issue of land rents takes on a very important meaning in all cases in which, aside from the objectives of the investment, a minimum economic return for the developer is achieved. In fact, urban land price is one of the most important production costs of a building.

This paper aims to investigate a possible trade-off between urban rent and housing affordability in a social housing investment, located in Pordenone in the northeast of Italy. The analysis conducted in this study is developed with reference to Giovanni Cechet's project, conducted in his master's degree thesis, and is based on some specifications agreed at a preliminary stage by the FVG (Friuli-Venezia Giulia) Housing Social Consortium, which is the promoter of a real intervention on the same plot.

2. State of the Art

2.1. Housing Affordability

The theme of social housing is of interest to the scientific communities that deal with social sciences, urban planning, architecture, and engineering. Beyond the purely technical and technological aspects, the social value of this type of intervention is an aspect on which these different scientific communities focus more closely.

By introducing the concept of housing affordability, it is useful to distinguish market (business as usual) and planner point of view. The point of view of the first is that of those who evaluate the potential market demand with respect to the placement price of the houses to understand if there is an adequate 'absorption' potential at a price that they consider profitable (full cost criterion in a monopolistic competition market as it is for new buildings). The planner point of view, however, concerns the policy maker who wants to evaluate the market's ability to provide accommodation at an affordable price and, otherwise, to identify adequate measures to solve the need. The compression of urban rent is one of these tools. The problem is often to determine how much urban rent must be compressed without violating the rights of landowners. Our contribution focuses on this.

There are different approaches to affordable housing, which are classified as follows [5].

- Categorical: A statement of the ability or inability of households to pay for market housing, but without a measurement foundation.
- Relative: Changes over time in the relationship between housing costs and household incomes.
- Subjective: Whatever individual households are willing or choose to spend.
- Family budget: Monetary standards based on aggregate housing expenditure patterns.
- Ratio: Maximum acceptable housing cost/income ratios.
- Residual: Normative standards of a minimum income, required to meet non-housing needs at a basic level after paying for housing.

Among these approaches, the ratio approach has the longest history and widest recognition in assessing affordability.

Furthermore, one of the main problems related to social housing interventions concerns the measurement of their social impacts. In the scientific literature, it is possible to identify quantitative, monetary non-monetary, and qualitative approaches. However, it appears somewhat difficult to standardize the measurement process, as less binding approaches and case-specific approaches are almost always preferable [6], although it is possible to identify attempts to classify the different available approaches [3].

A recent study set in the province of Siracusa [7], which involved seven municipalities, dealt with the issue of housing problems and their resolution through traditional and innovative planning tools. In particular, the analysis aimed at identifying the problems was carried out using data on the distribution of wealth, in terms of incomes, house prices, and income thresholds that filter access to the

real estate market. The results show that many families do not have sufficient income to access the real estate market, and at the same time, their income is too high for them to access public housing.

Another study [8], set in Palermo, investigated the real estate market and the income thresholds to highlight the operational and critical aspects related to household accessibility to the free market and estimate the financial gap corresponding to the impossibility of accessing housing.

On the other hand, some works have focused on the analysis and application of the social return on investment (SROI) methodology, aimed at measuring the extra-financial value with respect to the invested resources [2,9,10]. For example, by applying a social housing redevelopment intervention in Rovereto, a recent study investigated the potential of this method to provide decision makers with an integrated multi-objective evaluation tool [11].

Other studies have focused on the relationship between the accessibility of housing and the need to build sustainable housing from an environmental and economic point of view. Among these, a very recent study [12] focused on the identification and classification of different critical success criteria (CSC) for measuring the sustainability performance of so-called affordable housing through a global review of the literature. In this area, another similar work, set in China [13], investigated the problems associated with integrating various aspects of sustainability in social housing projects, aiming to identify key sustainability performance indicators that can perform the task of guiding the development of social housing projects.

However, the challenge that this study specifically intends to face remains to be investigated, that is, the relationship between the urban rent of soils (and therefore the value of the areas) and the feasibility of social housing interventions in terms of social and economic objectives.

2.2. Urban Rent

Studies concerning urban rent originally defined it as "the price paid for land use" [14]. In this definition, rent represents the characteristics of soils that contribute to their productivity. According to Marx, the birth of rent theory is to be attributed to Anderson [15], who defines rent as what is paid for the use of the most fertile soils and therefore as the differential price for the use of a specific quality.

In the early nineteenth century, some authors proposed a definition of residual rent. Malthus [16] states that rent is the difference between the market price and the cost of production, while Ricardo specifies that the cost of production is that determined by the cost of labor on the least fertile land [17]. The last classical economist who debated the concept of rent is Marx, who introduced the distinction between differential and absolute rents [18]. Differential rent originated from the various soil rates (Ricardian rent), while absolute rents originated in cases where the soil regime tends toward a monopoly condition. Von Thünen [19] made the first contribution that links rent more directly to location and less to soil fertility. He notes that the prices of agricultural goods also depend on transport costs between the production site and marketing centers. To a lower cost of transport he therefore attributes a higher value added from the sale of a product.

Land rent definitely represents the remuneration to the owner of the natural production factor, i.e., soil in this case. In practical terms, urban rent can be defined as the difference between the value of the built-up land and the sum of the depreciated value of capital invested in public infrastructure, the depreciated value of the buildings constructed and the agricultural value of the land itself.

The definitive analytical contribution to the theory of rent and its influences in the urban environment [20] were given by Alonso [21], who formalized von Thünen's principle of accessibility to the location of productive and residential activities in urban structures. The dynamic aspect of rent introduces the question of the balance between demand for accessibility and rent supply, i.e., between location and urban rent.

In the case of interest, i.e., residential activities, in this study, the propensity towards central locations develops competition that affects the price level of the relative areas and urban income levels. Since residential costs are not only related to the location, but also to the size of the apartments, it follows that once you have defined the income you expect to spend, you can allocate this expenditure

between the costs related to the size of the apartments and those arising from the location. The choice of the equilibrium point is made according to the structure of the individual utility function, as shown in Figure 1.

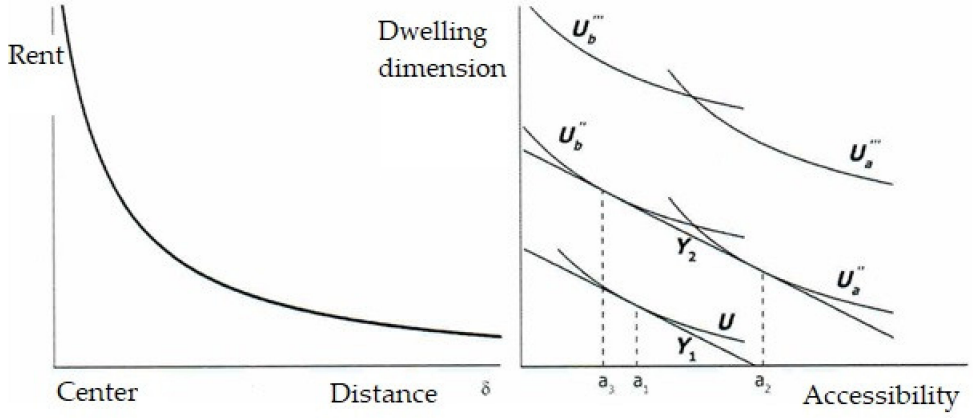


Figure 1. Relation between the rent and location of residential units, adapted from Reference [20].

As the total income spent increases (from Y_1 to Y_2), individuals who belong to families of lower indifference curves (U''_a and U'''_a), and for whom accessibility to the center is a higher asset, will tend to favor the latter, even at the cost of reducing the dwelling size. On the contrary, individuals who express the higher curves of indifference (U, U''_b, U'''_b), for whom the higher good is represented by the size of the apartment, will favor this option over accessibility.

There are also more specific aspects that link urban rent to the urban environment, in addition to the distance from the urban center. For example, the presence of green urban spaces affects the value of properties and even differently according to the type of urban green spaces [22].

Recently, the concept of 'pure rent' was introduced. It refers to the deviation of rent itself from real economic values to integrate with financial ones [23]. In fact, an analysis carried out in France on the time series from 1850 to 2008 showed that the ratio between real estate values and purchasing power remained constant over the long term, while rent increased significantly in the 1990s, which is unrelated, as mentioned above, to real economic values and integrated with financial values [24]. In those years, in fact, the real estate fund instrument took hold, which allows for the inclusion, in a single investment portfolio, of the properties of multiple properties involving even small investors. From that moment on, the valorization of the building transformation was only partially linked to the physical conditions of the building, while it was more connected to the macroeconomic trends deriving from financialization.

The formation of pure rent has had important effects on the rental market, especially for the lower-middle income groups, which have been the protagonists of a progressive phenomenon of migration towards the hinterland of the cities.

In Italy, the end of the fair rentals regime in 1998, in the absence of a reform of social housing policies, favored the formation of pure rent and therefore the speculation of large investors through the instrument of the real estate fund. In this regard, an interesting study of the Italian real estate market [25] investigated the cause and effect relationship between property sales prices and rents. It was found that house prices can influence rents, but not the other way around. In the past decades, the demand for housing in Italy, even for investment, does not consider rent as a proxy for the corresponding dividend.

The governance of land rents, in the context of social impact investing, is a determining element in creating both social and economic value. In this case, public actors who can provide low-cost abandoned areas play a fundamental role.

For example, a recent study [26], which partially focused on the theme of the regeneration of abandoned urban areas (social aspect) in the context of public-private partnerships, developed

and tested a model that aims to determine a series of combinations of urban planning parameters. These parameters have to be attributed to abandoned areas capable of reflecting the right distribution of burdens and financial advantages (economic aspect), which is the basic reference for bargaining between public and private entities. The results confirm the potential and flexibility of the model, as well as the possibility of implementing urban regeneration strategies that ensure minimum financial returns.

This contribution, through a cash flow analysis, investigates the economic feasibility and social impact of a social housing project in the northeast of Italy in order to explore the trade-off between urban rent and social value, i.e., the satisfaction of housing needs for households that cannot access public housing and the free market.

In fact, with the advancement of technology in the field of construction and the need to respond to increasingly stringent regulatory requirements in order to ensure an adequate energy and environmental performance of new buildings, the possibility to lower construction costs seems limited, even for the construction of affordable housing. In this situation, the achievement of the set economic return on the investment, which, together with the achievement of the social objective, represents the main objectives of social housing interventions, is strongly dependent on the market value of the area and therefore on urban rent.

3. Methodology and Application

The proposed methodology aims to define a trade-off between urban rent and social value in the context of a social housing investment, such as the one presented, on the basis of some specific assumptions concerning the affordable housing approach, which will be illustrated below.

As mentioned, from the operational point of view, the research is based on a cash flow analysis of a social housing intervention over a time horizon of 18 years. The aim of the research is not to assess the economic sustainability of the investment, but rather to determine which are the household income ranges that, according to the concept of the affordable housing, can access social residential buildings by guaranteeing a real economic return target of 3%, i.e., the net inflation. The expected return value is established by FIA [27]. This value lies between the risk-free investment return and plausible returns of a property developer in business as usual conditions. Considering that the placing on the market of housing at prices lower than market prices entails lower risks than those characterizing a traditional real estate investment, the rate assumed is considered consistent.

The analysis will be characterized, as described below, by the variability of the cost of the area and of the construction works.

With reference to the concept of affordable housing, understood as the ability to access a home with a reasonable economic effort of a family unit, it is necessary to define income brackets, from which, applying the commonly used rate of 30%, an affordable fee/mortgage installment can be calculated.

The calculation is performed as follows:

$$C_{acc} = 0.3 \cdot R_{nf} - S_{gm} \quad (1)$$

where:

C_{acc} is the affordable house annual fee/mortgage instalment;
R_{nf} is the net family income;
S_{gm} are the costs of management and maintenance.

Housing management and maintenance costs are proportional to the size of the dwelling and are assumed to be equal to €10/sqm per year.

The affordable prices of each dwelling are determined by calculating the present value of the installment C_{acc} in addition to the advance A_{nt}, which is calculated as follows:

$$A_{nt} = 0.2\, C_{acc} \cdot n \quad (2)$$

This is equal to 20% of the instalment due for the overall contract period. The duration of the loan has been set at 20 years (for families of up to three members), 25 years (duration of the loan for family units of four members), or 30 years (for families with more than four members) as follows:

$$P_{conc} = C_{acc}\frac{(1+r)^n - 1}{r(1+r)^n} + A_{nt} \quad (3)$$

where:

P_{conc} is the affordable price;
r is the fixed rate of bank interest, equal to 2%;
n is the duration of the loan (20, 25, or 30 years);
A_{nt} is the advance.

The rent with ransom is given by the sum of the pure rent plus an advance on the redemption at the end of the lease.

$$C_{acc} = Q_{loc} + Q_{ant} \quad (4)$$

where:

Q_{loc} is the portion of the pure rent;
Q_{ant} is the portion of the advance on the ransom.

The advance on the redemption is equal to 20% of the affordable price for the sale of the dwelling P_{conc} and is distributed in 8 years or 15 years, depending on the duration of the lease, before the redemption:

$$Q_{ant} = 0.2 \cdot P_{conc}/m \quad (5)$$

where:

m is the duration of the lease (8 or 15 years).

Finally, the redemption price (P_{risc}), provided that there is no revaluation of the property value, is equal to:

$$P_{risc} = P_{conc} - Q_{ant} \cdot m \quad (6)$$

4. Case Study

4.1. The Social and Economic Context

The case study is located in the municipality of Pordenone, which, together with its entire province, has seen a constant development, from 1990 to 2006, of widespread urbanized areas using low-density solutions (Figure 2).

Figure 2. Location of the case study in the context of Pordenone Municipality (satellite view by Google Maps®).

From an economic point of view, the entire province had an economic trend that went against the trend during the crisis: The level of employment between 2007 and 2011 showed an increase of almost 3%. This testifies to a strong industrial sector.

Unlike in the 2000s, the Pordenone residential context has witnessed a recent migration, that is, a return from the peripheral areas to the central ones. This growing demand is opposed by an inadequate offer of both used and new buildings.

With regard to the income data, reference was made to the report, "Life, Income and Physical Health of Families, 2017" (Italian National Institute of Statistics, ISTAT 2018), which shows the net average and median family incomes by the number of components (Table 1).

Table 1. Net household income for the northeast of Italy, 2017 (source: Italian National Institute of Statistics—ISTAT).

Family Components	Family Income [€]	
	Average	Median
2—couples without children, under 65	39,533	36,736
3—couples with a minor	41,462	39,674
4—couples with two minors	42,445	39,977
5—couples with three or more minors	45,652	39,263

As can be seen, the median income is lower than the average, and this indicates that there is a concentration of income in the higher income range. To obtain information on the distribution of wealth, we use the Gini concentration index I_G, which is formulated as follows:

$$I_G = \frac{\sum_i (P_i - Q_i)}{\sum_i P_i} \tag{7}$$

where:

Q_i are the cumulative percentages of income;
P_i are the cumulative percentages of income in the case of equal distribution.

A value of 0 indicates that all families receive the same income, and a value of 1 indicates that the total income is received by a single unit.

For Northeastern Italy, ISTAT provides a Gini index for 2017 equal to 0.279, which is the lowest in Italy in that year. In the south and the islands, the index is 0.334; in the center, it is 0.318; and in the northwest, it is 0.311.

From 2004 to 2011, requests for contributions to the National Fund to support access to rented dwellings received by the municipality of Pordenone were in constant growth (from 247 to 620 applications). On the other hand, in the same period, the funds available decreased from an outstanding percentage of requests of just over 50% in 2009 to almost 75% in 2011. Even the accommodations made available as public residential buildings were not enough to meet the demand. In this context, the implementation of social housing interventions is justified for the following reasons: The offer does not meet the demand, the population is growing, and even the public residential building accommodations do not meet the specific needs.

The following section illustrates the physical characteristics of a social housing project in the municipality of Pordenone.

4.2. The Project

The project under analysis involves the construction of five buildings. The design choices have led to the adoption of non-traditional technological solutions, such as the creation of green roofs, since these can offer benefits not only to the private individual, but also to the community [28,29] (Figure 3).

Figure 3. General plan of the intervention and identification of the buildings.

Buildings A, B, and C are for residential use and provide the following subdivision of houses in relation to the number of occupants, as shown in Table 2. On the ground floor, building C also houses commercial units and services, with a total area of approximately 560 square meters.

Table 2. Subdivision of dwellings.

ID	Number of Occupants	Number of Dwellings
2P	2	24
3P	3	15
4P	4	23
5P	5	14
6P	6	8
Total		84

Building D is intended for the community. In fact, the designer has taken into account that, for social residential buildings, i.e., interventions of modest dimensions, such as the one in question, it is also advisable to provide real estate units capable of favoring social aggregation. Building E will host a residence for the elderly. In this regard, it is good to specify that the original destination assigned to the urban area relates to welfare activities for elderly people.

For this reason, the agreements made with the local authority by the promoter of the real intervention, Consorzio Housing Sociale FVG, also allow for the construction of a real estate unit intended for social housing.

The basement floor of buildings A, B, and C will host parking spaces and technological substations.

4.3. The Investment Cost

In a real estate investment, the cost of the area is one of the most significant items determining whether or not the investment will be profitable. Given the high technological complexity that characterizes new buildings, the value of the area is perhaps the only item, among the costs of an investment, that could be compressed.

The cost of the area has been estimated by direct comparison with building areas located in the same peripheral area of the city of Pordenone, taking into account the total lack of urbanization of the area of interest, resulting in a unit value of €75/cbm of building volume, with a total area value of €2,224,500.00. This value has been subject to changes in the scenario, which will be included in the results section to investigate, in qualitative and quantitative terms, the influence of the cost of the area on the economic return on the investment. The construction cost is estimated using a survey on the local construction market, taking into account the scale economies due to the size of the intervention. This cost item always retains a characteristic of variability. Therefore, this cost was also varied within the simulations. Table 3 reports the "most likely" values of the various building components.

Table 3. Most likely values.

Asset/Object	Cost [€/sqm]
Buildings	1000
Underground parking	450
Parking on the ground level	75
Green and equipped green	35
Public roads	80

For these values, the total construction cost is estimated at €10,150,312.50, with an incidence on the building areas of approximately €1150/sqm. Of the total, the primary urbanization works amount to €532,312.50. In the scenario analysis, the construction value of the buildings will be varied to capture its influence on the overall return on investment. The other costs will not be considered as variables for the purposes of the calculation.

In Italy, authorization costs are divided into primary and secondary urbanization charges and contribution to construction costs. Costs occurred in carrying out primary urbanization, which was deducted from the primary urbanization charges. The contribution to the construction cost is due in relation to the cost itself, estimated in accordance with specific parameters provided by the municipality. This contribution is always due for new construction interventions. In the case study, the costs for primary urbanization works are higher than the charges due to the municipality, and therefore, the latter are not due. Secondary urbanization charges are always due for social services supporting an urban settlement, such as nurseries, schools, and shops. The costs of secondary urbanization and the contribution to the construction cost have been estimated using the unit values and the rates of the municipality of Pordenone and amount to €489,013.02.

The technical costs, including the fees for architectural and specialist planning, specialist reports, works management, testing, safety coordination, and stacking, are generally calculated as a lump sum

through a rate on the construction cost. The value of this rate varies between 10% and 5%. An average rate of 7.5% is adopted.

Under general and unexpected expenses are considered those expenses related to the organizational structure, which is put in place for the investment. To these are added the expenses related to possible unforeseen events. They are estimated considering a rate on the construction and technical costs. A rate of 5% is usually adopted.

In order to advertise and market the real estate units, whether they are rented or sold, it is appropriate to take into consideration the relative expenses. Additionally, in this case, this cost is estimated in a simplified way by applying a rate to the value of the sold or monthly rent. This rate usually varies between 2% and 5%. Since this is an intervention of social value, a rate of 2% is adopted.

The management costs of the rented accommodation are assumed to be equal to 5% of the annual rent and distributed over the entire duration of the lease.

For a social housing intervention, as stated by the FIA regulation, unlike a normal private building intervention, it is important to consider a further cost, that is, the one linked to the social project. This is also calculated as a rate and is reasonably assumed to be equal to 2% of the construction cost.

Part of the capital invested is in debt. The "Statistical Bulletin 2017" of the Bank of Italy shows that, for Northeastern Italy and for loans over 5 years, the interest rates applied to non-financial companies related to the construction sector are equal, at 2.44%. Considering that for these types of investments, which cover a social value, bargaining on the interest rate is highly probable, a rate of 2% can realistically be assumed. From the same source and for the same conditions, we note an active interest rate of 0.08%, which is assumed to be 0%.

Finally, the last cost item to be considered concerns taxes on profit. Social housing initiatives, which are usually undertaken through the financial instrument of the real estate fund, such as the one in question, are subject to a particular tax regime, which does not provide for the taxation of corporate income and regional tax on production activities. For the purposes of taxation, the assets of the real estate fund remain suspended until the profits are distributed, at which point a withholding tax of 26% must be applied.

4.4. Estimation of Investment Revenues

The different foreseen uses of the intervention can be classified as residential, commercial, social, or assistance. As for the residential use, which obviously represents the most consistent part, the investment revenues derive partly from sales at affordable prices and partly from rent, with a redemption at the end of a period of 8 or 15 years. The analyzed scenario foresees that 60% of the accommodations will be sold immediately, 20% will be leased for 8 years and then redeemed, and the remaining 20% will be leased for 15 years and then redeemed, as per in Table 4.

Table 4. Distribution of costs and revenues over time.

Year	0	1	2	3	4–9	10	11	12–16	17	18
Building area	100%	-	-	-	-	-	-	-	-	-
Urbanization works	50%	50%	-	-	-	-	-	-	-	-
Building works	50%	50%	-	-	-	-	-	-	-	-
Concession fees	50%	50%	-	-	-	-	-	-	-	-
Rent 8 years—lease	-	-	20%	20%	20%	-	-	-	-	-
Rent 15 years—lease	-	-	20%	20%	20%	20%	20%	20%	-	-
Rent 8 years—sale	-	-	-	-	-	10%	10%	-	-	-
Rent 15 years—sale	-	-	-	-	-	-	-	-	10%	10%
Affordable sale	-	30%	30%	-	-	-	-	-	-	-
Free market sale	-	30%	30%	40%	-	-	-	-	-	-

The commercial real estate units, the building for the community and the care building for the elderly will produce revenues following the sale on the free market.

5. Discussion of the Results

This section reports the results of the application of the method described above in a case study. As already mentioned, the objective of this work is to evaluate the trade-off between urban rent and the social value of the investment, considered as the size of a social group whose income allows for access to social housing policies but not to the free market sector. In this way, the intended economic return of 3% is guaranteed. To do this, the results of the different scenarios considered are defined below in Table 5.

Table 5. Scenario definitions.

Variables	Scenarios				
	Business as Usual	**1**	**2**	**3**	**4**
Cost of the building area [€/cbm]	75	0	0÷75	75	0
Cost of building works [€/sqm]	1200	1000	800÷1200	1200	800
Real economical performances SRI	5.5%	3.0%	variable	3.0%	3.0%

5.1. Business as Usual Scenario

The minimum income for accessing the free housing market has been calculated, considering a promoter of private investment, with the following assumptions:

- Cost of the building area: €75/cbm (most likely market value);
- Cost of building works: €1200/sqm;
- Discount rate (net of inflation): 5.5%.

The discount rate was determined according to the capital asset pricing model:

$$r = r_f + \beta\left(r_m - r_f\right) + r_s = 6.6\% \quad (8)$$

where:

r is the discount rate (expected minimum nominal return on the investment);
r_f is the risk-free investment return (assumed to be 1%);
β is the systemic risk coefficient of the investment (assumed to be equal to 1 for the real estate sector);
r_m is the return on a market investment (assumed to be 5%);
r_s is the specific risk on the investment (1.6%, according to the Manuale Operativo delle Stime Immobiliari MOSI procedure [30]).

Coefficient β defines the systematic risk in a business activity, compared to the average equity market risk. β increases proportionally to the activity's expected return increase due to a higher non-diversifiable risk. Assuming an inflation rate at 1%, we obtain a real discount rate of 5.5%.

Based on these inputs, the minimum incomes needed to buy a home of the same quality as those proposed in the social housing project have been calculated. The results are shown in Table 6.

Table 6. Minimum income for free market access.

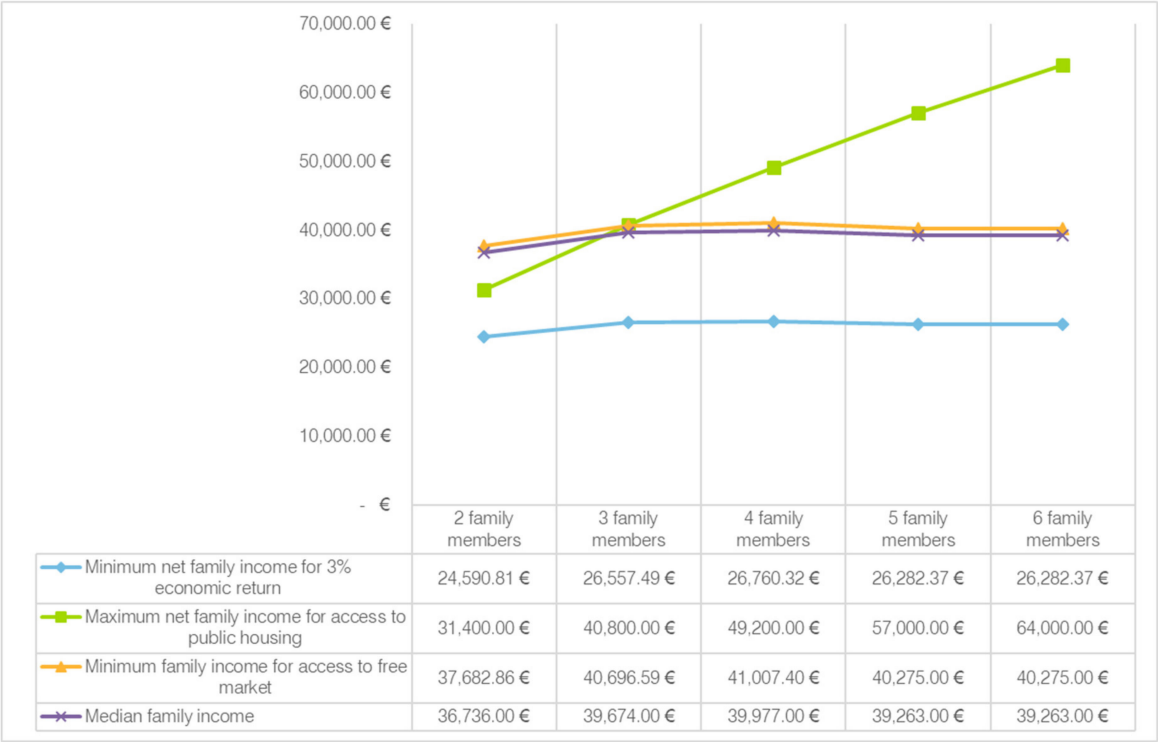
Family Members	Minimum Family Income [€]
2	37,682.86
3	40,696.59
4	41,007.40
5	40,275.00
6	40,275.00

5.2. Scenario 1: Null Cost of the Building Area and Most Likely Cost of the Building Works

In this scenario, following the discounted cash flow DCF model, the most likely values, reported in Section 3, were assumed to be as follows:

- Cost of the building area: €0/cbm;
- Cost of building works: €1000/sqm.

For this scenario, the income simulation, in which the investment is economically viable, is reported in Figure 4.



	2 family members	3 family members	4 family members	5 family members	6 family members
Minimum net family income for 3% economic return	24,590.81 €	26,557.49 €	26,760.32 €	26,282.37 €	26,282.37 €
Maximum net family income for access to public housing	31,400.00 €	40,800.00 €	49,200.00 €	57,000.00 €	64,000.00 €
Minimum family income for access to free market	37,682.86 €	40,696.59 €	41,007.40 €	40,275.00 €	40,275.00 €
Median family income	36,736.00 €	39,674.00 €	39,977.00 €	39,263.00 €	39,263.00 €

Figure 4. Minimum income to guarantee economic performance under the boundary condition of Scenario 1.

The assumptions underlying this scenario could be traced back to the case in which the area is made available free of charge by the public administration. This hypothesis represents the case, for example, in which the areas granted are bearers of negative externalities that are resolved through the intervention of social housing.

In this scenario, for the purpose of a correct analysis of the results, it is necessary to distinguish the income brackets of the two-member households and those with three or more components. For the former, it is reasonable to assume that, although they have an income that allows them to access public housing, they are excluded from the rankings of the assignment in favor of significantly lower incomes and, at the same time, cannot access the free market. As for the latter, on the other hand, it is likely that they could be assigned to public housing. Therefore, in this scenario, if on the one hand, the economic return is guaranteed, on the other hand, the social objective is only partially achieved.

5.3. Scenario 2: Variable Building Area Cost, Variable Cost of Building Works, and Income of Scenario 1

In this scenario, the variables have been set as follows:

- Cost of the building area: Variable between €0 and €75/cbm;
- Cost of building works: Variable between €800 and €1200/sqm.

The incomes considered for the calculation of the rent, sustainable installment and, therefore, housing prices have been determined on the basis of the income in Scenario 1.

In Figure 5, the simulation results are represented, where, on the y-axis, we find the economic return as a percentage and, on the x-axis, we find the cost of the building area. Each curve represents the values of the economic return, with variations in the cost of the area, for each of the fixed values for the cost of the building works (€800, €900, €1000, €1100, and €1200 /sqm).

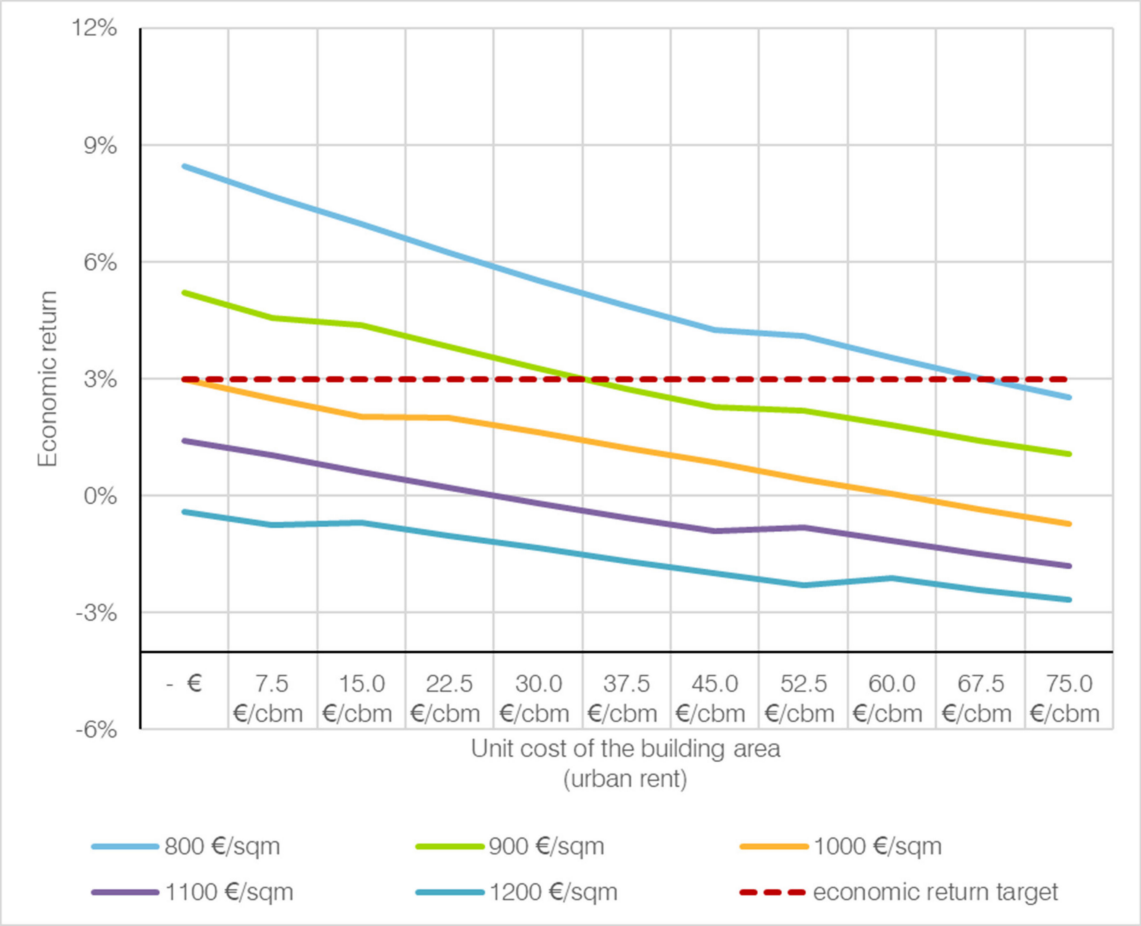


Figure 5. Trend of economic return in relation to the cost of the building area and building works.

It should be noted that, for the costs of building works exceeding €1000/sqm, in the income range considered, and therefore on the basis of the associated affordable prices, the economic return target is never reached, and the building area cost even reaches zero. Assuming a construction cost of €900/sqm, the investment achieves a minimum profitability of 3% only by halving the market value of the building area. If the construction cost is reduced to €800/sqm, the minimum return is achieved by reducing the market value of the building area by 10%.

Figure 6 shows the cost of the building works, i.e., the unit cost of the area limit curve, above which all the combinations for which the return is less than the target of 3% are placed and below which are found all the combinations for which at least a 3% economic return is guaranteed.

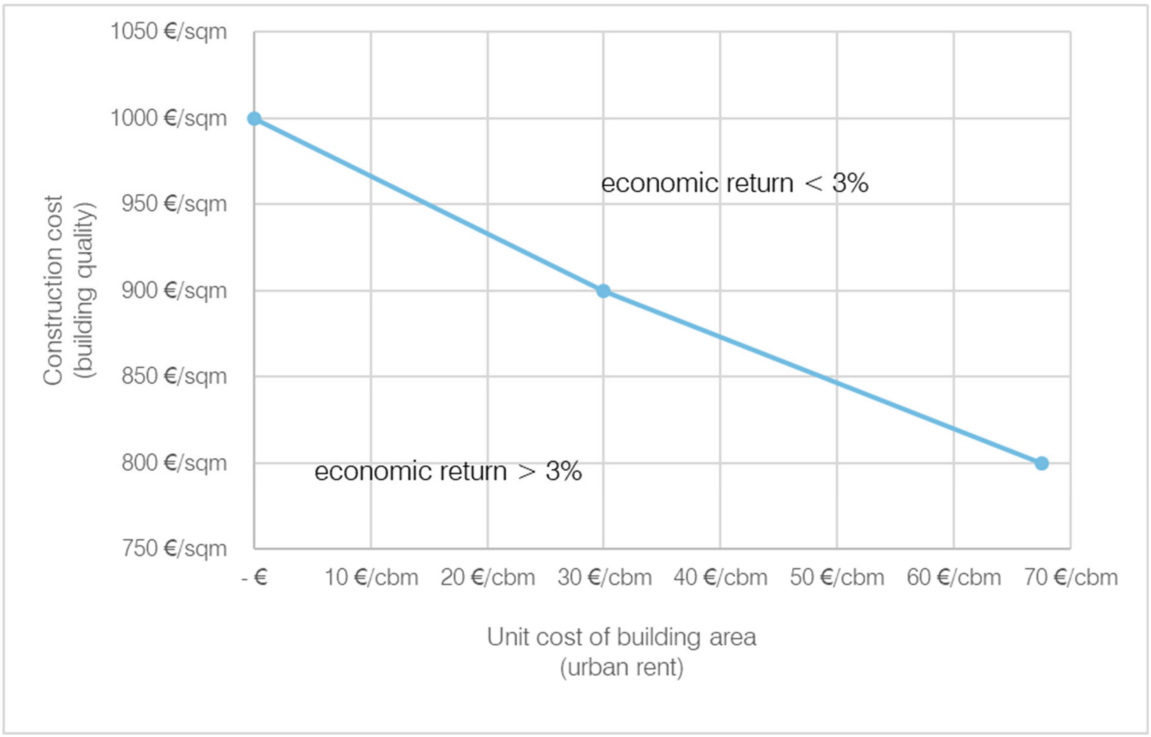


Figure 6. The trade-off between the building area cost and construction cost.

5.4. Scenario 3: Free Market Cost of the Building Area and Maximum Cost of the Building Works

In this scenario, we look for the income range in which we can reach the economic target by setting the following conditions:

- Cost of the building area: €75/cbm (estimated value, maximum hypothetical);
- Cost of the building works: €1200/sqm (maximum hypothetical).

The minimum incomes that are convenient for the investment from an economic point of view are reported in Figure 7.

	2 family members	3 family members	4 family members	5 family members	6 family members
Minimum net family income for 3% economic return	33,871.34 €	36,580.23 €	36,859.60 €	36,201.28 €	36,201.28 €
Maximum net family income for access to public housing	31,400.00 €	40,800.00 €	49,200.00 €	57,000.00 €	64,000.00 €
Minimum family income for access to free market	37,682.86 €	40,696.59 €	41,007.40 €	40,275.00 €	40,275.00 €
Median family income	36,736.00 €	39,674.00 €	39,977.00 €	39,263.00 €	39,263.00 €

Figure 7. Minimum income to guarantee the economic return target under the boundary conditions of Scenario 3.

The assumptions underlying this scenario could be traced back to the case in which the area is purchased at market value directly from the private individual and the technological solutions adopted for the construction of the buildings are such that the cost of the works is the maximum inside of the assumed range.

In this case, it is appropriate to distinguish between the income range of the two-component and that of the three-component units too. The former has an income higher than the maximum acceptable for access to public housing. However, they do not yet reach the minimum income values for access to the free market. The three-component units, on the other hand, have an income lower than the maximum allowed for access to public housing.

In this scenario, therefore, the social target is not satisfied for any family unit. In Figure 8, we observe the frequency distribution of income for a family composed of two people. The orange area (36%) represents households whose income is lower than the maximum expected for access to public housing. The blue area represents (9%) households that cannot access the free market but nevertheless have a suitable income to access social housing. The purple area (7%), on the other hand, represents those households whose income is higher than the maximum for access to public housing and lower than the minimum for access to social housing and whose housing needs, therefore, are not in any way satisfied.

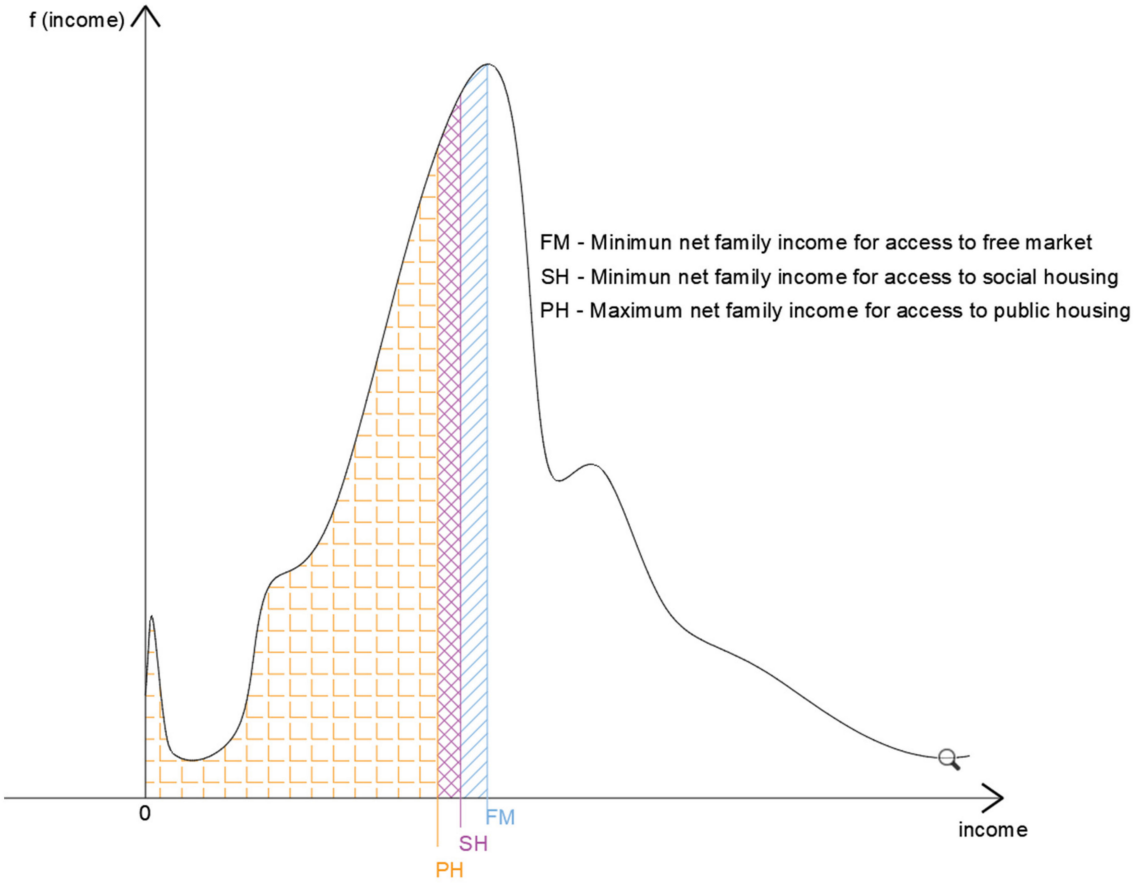


Figure 8. Frequency distribution of the net income for families of two people in Pordenone.

5.5. Scenario 4: Null Cost of the Building Area and Minimum Cost of the Building Works

In this scenario, we look for the income range in which we can reach the economic return target by setting the following limit conditions:

- Cost of the building area: €0/cbm;
- Cost of building works: €800/sqm (conceivable minimum).

The minimum incomes that are convenient for the investment, from an economic point of view, are reported in Figure 9.

Figure 9. Minimum income to guarantee the economic return target under the boundary conditions of Scenario 4.

The assumptions underlying this scenario are similar to the first, with the difference that the technological solutions adopted for the constructions are of low level and therefore the relative cost is equal to the minimum in the hypothesized range of values.

This limit scenario allows relatively low-income groups to access housing from the social housing project using sustainable installments or rents. In fact, considering areas that have zero costs and with very low costs associated with building works, a condition is created in which the achievement of the economic return target is feasible, even for income groups that can potentially access public housing. However, in this case, the social objective, which is to provide for income groups that cannot access either public housing or the free market to find dwellings at affordable prices, is not achieved.

Table 7 provides a summary of the results obtained in each scenario.

Table 7. Summary of income values for real economic target in different scenarios, with reference to the definitions shown in Table 6. For Scenario 2, please refer to Figures 5 and 6.

Family Members	Scenario				
	BAU	**1**	**2**	**3**	**4**
2	37,682.86	24,590.81	24,590.81	33,871.34	20,125.56
3	40,696.59	26,557.49	26,557.49	36,580.23	21,735.12
4	41,007.40	26,760.32	26,760.32	36,859.60	21,901.12
5	40,275.00	26,282.37	26,282.37	36,201.28	21,509.96
6	40,275.00	26,282.37	26,282.37	36,201.28	21,509.96
Real economical performances SRI	5.5%	3.0%	variable	3.0%	3.0%

6. Concluding Remarks

This study investigated the relationship between urban rent and accessibility to social housing in the case of a project set in an area characterized by widespread economic development and urban sprawl. Assuming a real economic return target of 3%, through a cash flow analysis of the investment,

various hypotheses were evaluated by varying the building area cost and construction cost to verify whether and in which cases both objectives were met: The social and the economic ones.

Scenario 1 considers the cost of the building area to be equal to zero, and the most likely cost of the building works is taken to be €1000/sqm. The simulation shows that if, on the one hand, economic performance is guaranteed, on the other hand, the social objective is only partially achieved. In fact, for families with two people, it is reasonable to assume that, although they have an income that allows them to access public housing dwellings, in the assignment rankings, they are excluded in favor of significantly lower incomes. This is because the public housing offer fails to meet the entire demand, and such families therefore fall within the social housing beneficiary range, as they cannot access the free market due to insufficient income. Families with multiple components, on the other hand, can access public housing and therefore do not fall within the target of the evaluated intervention.

Scenario 2 demonstrates how the two cost variables (building area and construction) significantly affect economic and social returns, highlighting how for costs of building works exceeding €1000/sqm, for the income brackets considered, and therefore on the basis of the associated affordable prices, the economic return target is never reached and even makes the area cost zero.

Scenario 3 leads to the conclusion that, considering the cost of the area at the most likely market value and the maximum simulated building cost of €1200/sqm, the social and economic goals can be achieved simultaneously only for households with two people and for a limited range of income.

Scenario 4, with hypothetical minimum values, allows relatively low-income groups to access social housing, with sustainable installments or rents. These social groups are those that can potentially access public housing. However, in this case, it is believed that the social objective of providing dwellings at affordable prices for the income groups that cannot access either public housing or the free market is not achieved.

The analysis has highlighted how urban rent and the quality of buildings significantly influence the effectiveness of social impact investing. In fact, the social brackets whose incomes allow for access to social housing and, at the same time, allow the minimum economic return target to be realized are broadened and reduced, as a function of both the rent paid to the owner of the land and the quality of the buildings. In this sense, we can identify the trade-off between urban rent and social value: With a decrease in the rent paid to the landowner, social groups whose income allows for access to social housing increase.

Finally, the aforementioned concept of affordable housing is understood as a family unit's ability to access a home with a reasonable economic effort. This "reasonable effort" was considered to be equal to 30% of the gross income of house maintenance expenses. It is believed that a greater articulation of the concept would be appropriate. Assuming, in fact, for a family unit made up of two people, with a net income of €30,000.00, after deducting 30% of home expenses a net income of €21,000.00 remains for other family expenses and €10,500.00 per component. If, on the other hand, we assume a family unit made up of four people with the same income, the share of household expenses is the same, while the share of income per component to be allocated to other expenses is half and equal to €5250.00.

It would, therefore, be appropriate to include the variable, "composition of the family unit," in the concept of affordable housing in order to ensure that the share of income, equal to 30%, that is allocated to housing costs is not too high for large households. In this sense, a possible development of the research could concern the use of different metrics for affordable housing, such as the residual income approach.

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Social Housing: An Appraisal Model of the Economic Benefits in Urban Regeneration Programs

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Abstract: The decision-making process relating to Social Housing (SH) policies and projects involves social and urban transformations and is consequently linked to urban planning, urban regeneration projects, the dynamics of the real estate market and cooperation between public and private developers. Furthermore, this decision-making process must be supported by assessments relating to economic feasibility and assessments on social and environmental sustainability. The paper illustrates a decision support evaluation model for the implementation of integrated urban redevelopment programs related to Social Housing interventions to be implemented in PPP. The model is based on the search for an economic balance between the interests of the parties involved, with the aim of maximizing the share of housing in SH by minimizing the public contribution quota. The model was developed on a degraded settlement of Public Residential Construction, the subject of a wider urban regeneration program in the Municipality of Reggio Calabria (Italy). Considering the financial feasibility constraint for the developer and the conditions of the local real estate market, with the risk of the investment attached to it, the model makes it possible to verify the economic sustainability and the financial feasibility of the interventions in SH through the estimation of: (i) The profit of the developer/investor; (ii) the trade-in value to be paid to the developer against the investment; (iii) the maximum share of SH to be carried out in development. The research and the results obtained highlight the utility of the model and the ease of use in the programming phase, in relation to urban regeneration programs that involve interventions in SH.

Keywords: real estate appraisal; capital gain; financial feasibility; economic sustainability; public–private partnership; risk assessment; social housing; urban regeneration

1. Introduction

In Italy the solution to the problem of guaranteeing a dwelling place for the disadvantaged classes was entrusted first to the work of the "Istituto Autonomo Case Popolari (IACP)" and subsequently to the territorial "Azienda Territoriale per l'Edilizia Residenziale (ATER)", which had the task of promoting, realizing and managing public buildings from assignment to the less well-to-be leased to fixed fees.

The huge amount of dwellings built in the eighties and the nineties, with the undoubted improvement of the living conditions of Italian families, up to what has been defined as a "society of owners", had effectively shut down the cultural and political debate on the "home problem", relegating it to a marginal theme; that is, concerning only specific market niches to be faced with the classic tools of assistance.

In the last twenty years, however, the socio-economic changes that have hit the globalized world have favored a phenomenon in sharp contrast: In Italy, as in various European countries, access to

home ownership has become a significant problem that is affecting, today, ever wider segments of the population [1].

This is due to many issues. On the one hand the global economic and financial crisis, which began in 2007 and is still ongoing, has had effects in the form of fewer jobs and the reduction of labor income and, therefore, on the purchasing power of families, making it more difficult to access credit and the subsequent purchase of the house. On the other hand, the active policies on welfare aimed at securing a cap for the weakest sections of the population have been weakened, especially in Italy, due to the greater budgetary constraints and the relative contraction of public spending on investments.

A third factor has affected the sociological transformation of society and the family, which has added to the social classes historically considered weaker (low income, unemployed, homeless, ex-prisoners, immigrants) other population groups (young couples, singles, spouses) separated/divorced, students, elderly) who are unable to meet their housing needs on the free market [2].

Thus, a new concept of social housing construction spreads in Europe, to be used in social innovation and smart city policies, aimed at responding to the various housing needs by creating spaces for socializing and sharing and, at the same time, for undertaken urban renewal and energy saving actions. Thanks to the spread of a growing sensitivity to environmental protection, the Social Housing (SH) initiatives represent, in fact, an opportunity to pursue goals of sustainability and energy efficiency, through actions of redevelopment of the zero consumption of land and the use of technologically advanced solutions for energy saving.

However, what makes an SH operation feasible is the financial equilibrium that governs the convenience regime for all those subjects who are an active part of this operation. In a historical period in which the public sector is no longer able, on its own, to carry out urban regeneration interventions, with an "appropriate" endowment of equipment and infrastructures, adequate to the effective, qualitative and quantitative demand of the population that resides and lives in the areas subject to redevelopment, it is the private sector that provides the necessary resources.

This is part of the concept of the new ecology of development, based on interactions and relationships between the subjects that make up the ecosystem, relationships thanks to which new mechanisms are triggered for the production of the value (economic, social, institutional and environmental value) based on the ability to put society and territories at the center. The response to these needs, put in place at an entrepreneurial level, goes increasingly in the direction of hybrid organizations, business models devoted to keeping social mission together with commercial activities [3].

Through public–private partnership (PPP) it is possible to allocate private financial resources also for SH interventions, avoiding to commit public resources [4]. The public–private partnership regime, which allows the creation of SH, can materialize in two ways:

1. Through the introduction of plan variations such as to produce increases in building rights to be granted to the private investor by way of remuneration for the investment;
2. Through the transfer of publicly owned building land on which to carry out the transformation, producing capital gain. The addressed model falls into the second case: A degraded public area is made available by the public to allow the private to carry out the transformation. Part of the land value will be transferred to the private in a reasonable amount to allow both the recovery of the invested capital and the profit of the developer.

In order to analyze the regime of convenience and thus make complex PPP operations on the subject of SH, various evaluation methods exist in the literature. Some techniques are designed to analyze the financial balance from the point of view of the private developer. Others, instead, focus on the qualitative-quantitative judgment of SH's intervention from the point of view of the community, or public convenience, expressed in terms of the quantitative provision of housing to be guaranteed at a controlled rate and/or qualitative endowment of the services of neighborhood and technological measures to reduce the costs of buildings under management [5].

A third, intermediate approach is focused on the appraisal of the capital gain generated by redevelopment of degraded areas in complex urban programs, implemented in cooperation between

public and private operators, and on how this value should be shared between the developer and the community [6].

The latter approach was developed in the context of the definition of redevelopment programs for degraded areas of the city of Reggio Calabria: The 'Contratto di Quartiere (CdQII)" and the "Programma di Riqualificazione Urbana Ravagnese (Riurb)" for which, given the obvious implications of an estimative and evaluative nature, the Municipal Administration had requested the technical, scientific support of the Economic Evaluations and Real Estate Appraisals Lab (LaborEst) of the Department of Cultural Heritage, Architecture and Urban Planning (PAU), in the phases of: preparation of the program, evaluation of the sustainability of the proposals private to admit to the Program, development of guidance tools for the promotion of architectural quality, appraisal of extra standard costs for developers that have adhered to the programs [7].

In this paper we intend to deepen the theme of the determination of the profit of the developer in the context of a redevelopment intervention carried out in PPP and, in the specific case of a SH intervention, to define in the feasibility analysis phase of the financial operation the distribution of the capital gain generated by the redevelopment intervention. Specifically, the contribution intends to deepen the method of determining the profit of the developer through the risk assessment phase related to real estate transactions.

The evaluation model developed is a synthetic tool to support decisions in the implementation of integrated urban redevelopment programs related to ERP interventions to be implemented in PPP, to be used in the feasibility study phase. It is based on the search for an economic balance between the interests of the parties involved, with the aim of maximizing the share of housing in SH by minimizing the public contribution quota.

The case study analyzed is a degraded settlement of ERP, the subject of a wider urban regeneration program in the Municipality of Reggio Calabria. Considering the financial feasibility constraint for the developer and the conditions of the local real estate market, the model allows to verify the economic sustainability and the financial feasibility of the interventions in SH through the appraisal of:

- Developer's profit;
- The trade-in value to be paid to the developer against the investment;
- The maximum share of SH to be carried out by the developer.

The research and the results obtained highlight the utility of the model and the ease of use in the programming phase of SH interventions.

2. Methodology

2.1. Appraisal of the Capital Gain in Urban Regeneration Programs

The condition for it to be deemed convenient to carry out a building requalification is to generate value.

The surplus (PVL) thus defined is equal to the difference between the market value (VM) of building products and the price of all the factors used in the production cycle (CP), in the event that the original value of the area is considered, or (CP') with the actual exchange value of the land (Different authors (Realfonzo, 1994; Prizzon, 2001) distinguish between ordinary profits and extra profits, including the former in the cost of production. In light of the specific cognitive framework and for the purposes of this work, it was considered more correct in the model to consider the production cost net of the ordinary profit of the promoter (UP). In the expression [1] the cost of the CA area is considered before the change of urban destination, its value is therefore corresponding to its original destination; in practice, however, the real production cost CP' is higher than CP as it includes the actual purchase price of the CA land: Although not equal to that of the building areas, it is higher than the original value, incorporating in the form of ground income a share of the capital gain generated by the expected urban variation).

$$PVL = VM - CP \quad (1)$$

$$PVL' = VM - CP' \quad (2)$$

Some authors believe that the capital gain is entirely transformed into ground rent, being incorporated in the increase in value of the areas following the urban variation: in this case it is possible to calculate the capital gain as the transformation value of the area [8].

Conceptually, the capital gain actually incorporates not only land rent but also ordinary profits and extra profits of the developer [9].

Among the figures that can benefit from shares of the capital gain there are:

- The Administration, public entity promoting the redevelopment program that finalizes its action to achieve greater urban quality, also through the construction of collective works and equipment;
- The developer of the intervention, sole interlocutor of the public subject, whose objectives are related to the maximization of profit;
- The builder entrepreneur, who has the profit on the construction cost (if it does not coincide with the developer, he does not intercept any additional capital gain);
- The owner of the area, whose objective is to maximize the value of the property in the variation of the annuity determined by the modification of the current urban planning instrument and therefore benefits from a share of capital gain in the form of ground rent;
- The lender, which focuses its investment on maximizing returns compared to other types of investments.

For a redevelopment intervention aimed at the realization of SH housing, generally the interlocutors can, in fact, be reduced to two, in addition to the entrepreneur who is responsible for the physical construction of the site, and that is:

- The body that owns the area with or without existing structures worthy of redevelopment. In this case, it is a matter of the municipal administration or of the ATER;
- The developer of the intervention who, participating together with other competitors in a manifestation of public evidence, is called to invest with own capital (or exposing himself directly with credit capital) to the realization of the work, renouncing, as far as possible, at a share of its profit that coincides with the discount offered during the tender. This developer generally coincides with the entrepreneur builder.

2.2. The Total Benefit (Bt) and the Developer's Profit (UP)

In the economic analysis of urban transformations, as developer's profit increases, there is a decrease in the income from real estate [10]. However, the appraisal of the developer's profit from the empirical point of view is not easy since it is difficult to draw on sufficiently reliable information.

The international and Italian literature in particular (Prizzon, 1995 par. 1.1; Forte, de' Rossi, 1992, par. 7.7; Realfonzo, 1994, par. 4.4.2) [10–12] focus on the appraisal of the developer's profit UP; this, ordinarily portrayed at the end of the process, represents the remuneration of the entrepreneurial capacity and the risk assumed by the developer. Generally the profit of the developer, in the real estate sector, is appraisal as a rate of the cost of production and investment (30%–40%) or in percentage on the market value of the realized goods (ordinarily between 20%–25%) [13].

2.3. Appraisal of the Devloper's Profit (UP)

The profit of the developer (UP) is ordinarily portrayed at the end of the process and can be estimated as a rate of the production cost; in reality the proposed procedure also allows an appraisal of the VM market value once the CP (In the economics of this discussion we will no longer distinguish the difference between CP and CP ', although it is to be understood CP ' considering that in it is included

the actual exchange value of the land after the transformation, greater than that possessed by the land before the intervention), production cost is known, as the sum of these costs and the developer's profit:

$$VM = CP + UP \quad (3)$$

On the basis of the considerations made in the previous contribution (6), to which we refer for due analysis, the gross profit (or the normal developer's profit) can take a value between 11% and 43% of the production cost value (CP).

Therefore:

$$UP = CP * 11 \div 43\% \quad (4)$$

that is, the profit of the developer can vary between a minimum and a maximum value:

$$UPmin = CP * 11\% \qquad UPmax = CP * 43\% \quad (5)$$

In order to accurately determine the percentage of gross profit to be applied for the appraisal of the profit of the developer, not being an elementary data of easy and direct retrieval, it follows that it is necessary to determine it indirectly by analyzing the circumstances that influence it.

The previous contribution had proposed the hypothesis that it is possible to assume that the thirty-two points of variation between the minimum profit (UPmin = 11%) and maximum (UPmax = 43%) are determined by a certain number of "ascending or descending influences "(F) (Realfonzo, 1994) which act, in successive increments, on the minimum profit (UPmin = 11%):

$$UP = UPmin + CP * F \quad (6)$$

where,

UP = developer's profit
UPmin = minimum developer's profit equal to 11% of C
CP = cost of building restoration intervention
F = UP variation factor, which fluctuates between zero and 32% of CP.

The variation factor "F" was calculated, through the application of a multi-criteria evaluation, as a percentage index of the influences due to the real estate market trend, to the geographical area, to the size of the city, to the urban location.

This contribution intends to offer an in-depth analysis on the determination of the variation factor F starting from the assumption that, as a rule, the profit of a developer is directly influenced by the risk of the financial transaction.

One of the most important assumptions in the financial field is that higher risk investments must necessarily correspond to a higher expected return; therefore the entity of the risk assumed by the investor will have to be related in some way and transferred to a quantity of profit that is expected to be generated by the financial transaction. To determine whether it will be adequately compensated for the risk it faces, an investor must therefore be able to understand the relationship between risk and return.

However, the quantification of risk is a very complicated operation especially in the real estate sector, given that real estate stands out, compared to other investment activities, due to a very high inhomogeneity and susceptibility to geographical space and time. The real estate developer is, in fact, faced with various types of risk since it does not have certainties about the occupancy/sale rates of the property units and does not know how long and to what rent or price fee it will be able to rent or sell them. Regardless of whether the investment will be made with own capital or will be characterized by financial leverage, the developer will have to face certain costs but will also have to face potentially very variable revenues distributed over a longer or shorter time [14].

Finally, we must not forget that PPP operations arise from the need of the public entity that, without satisfactory own resources, turns to private capital for the creation of a part of "public city"

and that when the private is involved to contribute with its investments to the realization of public services, to it are transferred also all the risks (or almost) that the operation brings with itself.

If this is true, then it is possible to compare some operations in PPP to a form of financial loan, even more singular than that carried out by the banking sector which provides itself with specific guarantees, since in real estate transactions all the risk is transferred to the subject developer.

2.4. Risk Assessment in Real Estate Investments

The risk, therefore, began to be linked to two variables that act simultaneously: the risk assumed by the creditor who was satisfied with an interest rate called "cost of money", to which was added the risk deriving from the investment transaction itself, for a total value ranging between 9% and 13% [15].

It is in this context that the financial approach has crept into traditional methods of appraisal, and techniques such as the "Costing" which divides costs by type (direct and indirect) and variability (fixed and variable) [16,17]; Discount Cash Flow Analysis (DCFA) to examine financial results and risks [18]; Profit Volume Analysis (CVPA) [2], break-even analysis BEA [19], taken from the business economy, they have since been used (and still are) to appraise the feasibility of real estate investments from a private point of view.

In addition to the cost of money, the risk factors that influence the discount rate of real estate investments can be [20–22]:

- Context risk: It depends on the position of the asset within the urban context and on the intrinsic characteristics of the real estate market in the area. The provision of infrastructure and services, and therefore the palatability of the area, can affect the gap between demand and supply of real estate, on average transaction times, etc.;
- Endogenous risk (property): It depends on typological and qualitative aspects of the asset, on its fungibility (i.e., alternative uses) and on external influencing factors, such as mortgages, pending legal actions and real rights on the asset;
- Lessee risk: It is the risk connected to a rental return and it depends on the financial reliability of the lessee and, if the property can be rented to more than one tenant, by the number of tenants (the greater the number of tenants, the greater the risk split associated with the investment);
- Liquidity risk: This is the risk associated with the average waiting time between the offer and sale of the asset. Basically the liquidity of a property is better in a market with greater demand than the offer; on the other hand, a lack of demand leads to lower sales prices;
- Financial risk: It can be linked both to the performance and the general conditions of the financial markets and to the financial structure of the investment project. This risk is reflected in the difficulty of the investor to easily obtain the financial credit;
- System risk: Concerns the local market level in which the work is inserted. It distinguishes itself in environmental risk, relative to the demographic and economic evolution of the market area, and regulatory risk, which instead refers to changes within the regulatory framework (including fiscal) that can affect sales and leases;
- Insurable risk: It is linked to the possibility that particularly serious exogenous events (such as natural disasters) may cause damage to the structure. This risk is defined as insurable as there is the possibility for the investor to cover himself from it by entering into insurance contracts. The random nature of these exogenous events suggests considering this risk class according to the cost of the insurance policy;
- Construction risk: This is represented by the possibility of a change in the time and cost of carrying out the work on site. This risk increases with the continuation of work on the site, until it becomes maximum at the time of testing, and can be determined by any authorizations during construction, by procedures necessary for the provision of credit or by technical problems (defects and defects not hypothesized in the technology, errors in the construction phase that cause significant damage to the work), uninsured or badly insured events, etc.;

- Testing risk: It is considered a significant risk as it marks the transition between all investments in deficit and positive cash flows. In the event of a negative outcome, two roads will be accessible: the execution of further works to make the work suitable (this however entails other construction costs as well as a delay in the times) or a downgrading of the work (with the consequent loss of value of the same). (It is believed that, in the real practice of managing construction sites, the risk of testing is much less significant than the construction risk. A project designed and built correctly and in accordance with the project will have no difficulty in the testing phase. During the testing phase, further investigations may be necessary to compensate for deficiencies in the construction management phase, but these are negligible burdens compared to unforeseen events due to design errors or even work accidents that could lead to the suspension of the site);
- Management risk: The property can be sold or managed directly by the developer of the real estate initiative. In both cases, in order for the work to generate positive operating cash flows that meet expectations, it must be well managed;
- Political risk, country and exchange risk: These three risk categories must be considered only in special cases, namely in the case of real estate development projects that arise in non-European and developing countries.

Not necessarily all risks must fall on the developer of the initiative. In fact, through the stipulation of a series of contracts, it is possible that the various risks connected to a real estate initiative are allocated to the other subjects participating in the initiative itself.

There are four methods to determine the amount of risk that characterizes a system being evaluated [23].

The first two fall within the Discounted Cash Flow Analysis (DCFA), in which it is possible to appropriately adjust the risk rate used to discount expected cash flows of a risky asset or, alternatively, directly adjust the cash flow values which, once transformed into certain equivalent flows, they can be discounted at a risk-free rate.

The analyst can then choose whether to appropriately modify the discount rates or the cash flows, taking into account the risks to which the transaction is subjected.

A third way is to correct the final result after evaluation, intervening on the appraisal obtained with an increase or a reduction of the value based on the calculated risk. Finally, another possibility is to observe the discount rate applied in market transactions with risks similar to that to be estimated and act in the same way.

All four methods have a significant critical aspect, namely the degree of subjectivity used by the evaluator in the adjustment of rates and flows. This problem can be partly overcome through the knowledge of the specific context and of the reference market and the verification of the results with other objective feedback elements if available [24].

The most used method in the literature is that of adjusting the discount rates, according to the principle that the more the asset is risky and the higher the rate must be to reflect, in the current value, the possibility of uncertainty of future flows.

Three techniques belong to this first category: The Build-up Approach, the Real Estate Risk (RER) Model and the Risk Weighting Model [25,26].

These techniques make it possible to determine the Risk Premium (PR) to be added to the rate of return on risk-free assets ("risk-free rate") in order to obtain the "global discount rate" ("risk-free adjusted" rate):

$$R = rf + PR \quad (7)$$

The risk-free rate represents the discount rate commensurate with the opportunity cost of capital, which only reflects the time value of money, net of the investment risk, and is represented by the return on government securities [10] (The risk-free rate comprises two portions. The first part depends on the forecasts that operators constantly develop on the evolution of the financial markets and therefore on expected inflation in the medium term. The second is the remuneration of an investment at zero

or almost zero risk: The typical case in Italy is that of government securities (BOT, CCP, BTP, etc.). From an operational point of view, the level of return covering these two units can be determined by comparison with government securities of similar duration. The actual yield on the securities, in fact, is defined by the nominal yield and the outcome of the placement auction, and this yield includes both inflation expectations and an almost risk-free profitability [10]).

The risk-free rate is therefore the cost of the money which, in the case of an investment made partly with own capital and partly with bank loans, follows the theorem of Modigliani and Miller whereby the average cost of capital is given by the weighted average of the cost of debt and the cost of equity respectively for the amount of debt and equity on the total value. The Weighted Average Cost of Capital (WACC) is given by:

$$WACC = Re\ (E/V) + Rd\ (D/V) \quad (8)$$

where,

D = amount of the developer's debt
E = market value of equity
V = total value of capital
Re = cost of own capital
Rd = average cost of debt capital.

2.5. The Multi-Criteria Analysis for the Determination of the Risk Premium

The PR risk premium changes according to the type of investment in relation to its riskiness. As part of the analysis of real estate investments, this risk is connected to the specific activity that is intended to be undertaken, the management model of this activity and the intended use of the property. More specifically, for the real estate sector reference is made to the classification of the risks already defined in the previous paragraphs, using for their estimation consolidated techniques in the financial sphere (Build-up Approach, RER Model, Risk Weighting Model) but which, in fact, draw on operational research on the subject of multi-criteria evaluation, for which the Theories and quantitative techniques of a multi-criteria nature have also been used to support financial decisions [27].

In recent years, in fact, the development of literature in appraisal-estimative disciplines has identified a certain applicative effectiveness in terms of risk management precisely in the multi-criteria approach, not only because it has a strong value of supporting decisions in the planning phase, but because the risk management process is fundamentally of a multi-criteria nature [28].

The numerous techniques developed in the academic field (Electre and Promethee, Multriattribute Utility Theory, Rough Set Teory, Real Option Theory, etc.) with the aim of estimating (quantitatively through the use of cardinal scales, ordinal or nominally listed) the effects of potential risks, however, all share the difficulty of expressing numerically a probability of occurrence or a monetary appraisal; in these cases it is possible to compare with priorities, ordinal or nominal (considered units of measurement), using the experience of the experts involved [29] through the associated use of methods such as: Project Brainstorming, Swot Analysis, Focus Groups, DELPHI Method, Panel of Experts, Community Impact Analysis, etc. [30] (These judgments expressed by the subjects actually represent subjective forecasts, the limits of which can be partially overcome by risk assessment activities organized in groups, that is to say, trusting in the greater reliability of the group decisions compared to those of the individuals).

Whatever the model and the multi-criteria technique that is considered to be used in the various risk assessment situations, in the case in question the objective is to attribute to the PR risk premium a percentage value in the range between 11% and 43% of the CP production cost.

In the present contribution, which does not intend to reserve much space for the use of a specific technique, a simplified multi-criteria approach will be used. The overall risk share of 32% will be spread

evenly across the various risk criteria. Su n. 11 types of risk, the maximum attributable valuation is equal to a value of 2.909 (understood as a percentage value of CP).

Once the cardinal assessment scale has been defined at three levels (1, 2, 3, plus the zero score), it will be possible to assign an evaluation to each risk and, through an easy weighting operation, identify the corresponding risk value between zero and 2.909.

The sum of the scores obtained returns the value of the risk premium to be added to the minimum risk share of 11%. The value obtained corresponds to the risk factor F to be replaced in formula (6), necessary to quantify the developer's profit UP.

Therefore, CP is directly influenced by the nature of the work or by the qualitative elements of the same: the better the quality of the building works (quality of materials, endowment of collective services or greater allocation of urban standards, technological equipment, etc.) the greater will be the production cost of the work; F instead is directly linked to the investment risk. Below a threshold of 11% profit (of the invested capital) the investor does not have (or should not have) an investment interest. The share of profit above 11% represents the risk that the investor is willing to assume for an appropriate remuneration at the end of the financial transaction.

2.6. The Distribution of the Capital Gain Generated by the Investment in PPP

Once the value of the UP has been defined, it is a question of determining the right distribution ratio, between the public and private subjects, of the capital gain generated by the investment.

In the case of a building redevelopment (or urban regeneration) under the PPP regime, two other factors that can influence the share of private investment must be considered plausible:

- Any costs related to the temporary accommodation of the tenants of the public housing subject to redevelopment (Ctemp) which could also be charged to the developer;
- Any financial contributions made available to the public entity (e.g., regional and national loans or own economies) and which, although small, reduce the amount of private investment.

Therefore one has:

$$C = (Cp + Ctemp - Cpp) \quad (9)$$

where,

C = invested capital
Cp = production cost of the work
Ctemp = cost for temporary housing of residents
Cpp = co-financing of the public entity.

In a redevelopment intervention with private capital of a public good for the construction of SH housing, it is plausible that a part of the redeveloped good remains in the availability of the private subject to be destined for the free market, as a fair return on investment. This amount must be equal to the sum of the capital invested by the developer to cover production costs plus its reasonable profit. Therefore, it is a matter of establishing the quantity of buildings (expressed in terms of real estate value or square meters of useful area or cubic meters of volume) to be sold to the investor and the amount to be paid to the public entity to be allocated to SH.

This model of allocation of the redeveloped asset is configured as an actual real estate exchange transaction (Vperm):

$$Vperm = C + UP \quad (10)$$

Starting from the report

$$VMt: Q = Vperm: Qperm \quad (11)$$

where,

VMt = value of the good after the transformation

Q = total quantity of the goods after processing (expressed in sqm or mc)
Vperm = value of the exchange to be recognized to the developer
Qperm = amount of goods to be exchanged in favor of the developer.

It can be established that

$$Qperm = (Vperm * Q)/VMt \quad (12)$$

from which to derive the quantity of transformed good to be allocated to SH (Qsh):

$$Qsh = Q - Qperm \quad (13)$$

By making the necessary replacements you will have:

$$\begin{aligned} Qsh &= Q - (Vperm * Q)/VMt = \\ &= Q - (C + UP) * Q)/VMt = \\ &= Q - [(Cp + Ctemp - Cpp + UP) * Q]/VMt = \\ &= Q * [1 - (Cp + Ctemp - Cpp + UP)]/VMt \end{aligned} \quad (14)$$

In conclusion, the characteristic of the proposed model consists in the fact that the private (promoter/investor) does not have to invest equity capital for the purchase of the area to be redeveloped, as it is a disused public property area made available by the public authorities under the partnership agreement. However, it could be useful for the public authorities that the cost inherent in the temporary transfer of the residents, who already occupy the houses being redeveloped, is borne by the public promoter (Ctemp).

In this way, the public authorities has the advantage of activating a requalification process by leveraging only on private capital and without having to invest public resources. On the contrary, in case of availability of resources, the public authority can intervene contributing to the financial operation in order to allow the financial feasibility of the intervention.

2.7. Verification of Sustainability Finance

The determination of the investment risk in this document is equivalent to the value of the developer 's profit (UP) in the context of a PPP transaction aimed at the construction of SH housing. The UP, according to what established in the introduction, must be between 11% and 43% of the production cost of the intervention (developer's investment).

The degree of inherent uncertainty in the assessment of risk, and therefore of the correct determination of the profit of the developer, would require an appropriate verification in order both to avoid generating an imbalance in the distribution of the capital gain harmful to the collective interests represented by the public entity and to avoid that very restrictive forecasts with respect to the developer may prove to be at all stimulating for the entrepreneurial interests of the latter.

Over the years many risk analysis techniques have been developed, attributable to sensitivity analysis, risk matrices, probability analysis, etc. [10,29,31,32].

In the case in question, the use of sensitivity analysis could be more appropriate, defined as the repetition of ultimate estimates always using the same model and systematically varying the inputs [28].

In the feasibility study phase of the PPP operation, it is possible to perform a simulation of the cash flows (DCFA) generated by the investment from the point of view of the developer, which takes into account the scenario resulting from the distribution of the capital gain and considering a plausible time span depending on the characteristics and size of the project.

As part of this simulation it will be necessary to use, as a discount coefficient, the value of the average cost of capital (WACC). The result will be the actual return in favor of the developer, or the risk premium (PR) consisting of the NPV.

In fact on the basis of the relation (7) R = rf + PR, the value of the risk-free is represented within of the WACC (The WACC allows an investor to establish the cost of capital by analyzing all its components and is an integral and fundamental element of the DCFA method. It represents the weighted average cost of capital which is represented by both the cost of equity (estimated through the CAPM) and the cost of debt capital. The risk-free rate is one of the three parameters of the CAPM and is conventionally represented by the yield of government bonds issued by the governments of economically stable countries. In continuity with resolution no. 623/15/CONS and in line with the practice adopted by the majority of European regulators for the estimate of the cost of capital, we intend to use the average yields of the ten-year BTPs for the estimate of the risk-free rate) while the PR is represented by the NPV, that is by the remuneration for the business activity at the end of the investment period.

This consideration is significant if referred to the report (6) UP = UPmin + CP * F, since the latter, representing all the business risk R, includes both the risk free, the other components of the WACC, and the risk premium.

3. Application

3.1. The case Study of the ATERP Buildings under the "Contratto di Quartiere II" of Reggio Calabria

One of the most significant interventions of the urban revitalization program [33] to be implemented with the "Contratto di Quartiere II (CdQII)" of Reggio Calabria in 2004 was the recovery of an abandoned area owned by the "Azienda Territoriale per l'Edilizia Residenziale (ATER)" (Table 1). Following the non-payment of the loan by the Ministry of Infrastructure and Transport, the interventions that included public co-financing quotas to be added to the private investments were no longer realized.

In this paper we want to present a revised and corrected version of the model used for the CdQII, proposing the intervention of recovery of the ATER area for the purposes related to a hypothesis of a program in Social Housing. Obviously, reference will be made to the market and cost values relating to the current conditions of the real estate market.

The project area is 9420 sqm, with a floor plan marked in homogeneous area B for 8915 sqm and in a homogeneous area F2 (public green) for 515 sqm.

The intervention consists of the demolition of the two existing structures and the replacement with three buildings to be used as residences, for a total of 60 apartments of different sizes, and for commercial activities (A technical expertise, commissioned by the public body to verify the stability of the two existing structures, had established the need for their demolition, as they could not be recovered both for the poor quality of the materials and for the subsequent regulatory updates on buildings in earthquake areas). The footprint of the intervention area is characterized by a two-story

underground parking area, whose roof is partly used for public spaces and partly for private spaces for the exclusive use of some residences. Specifically, the project data are the following.

Table 1. Project quantity.

Intended Use	Project Quantity	
	mc	sqm
Residential (h = 3 mL)	21,326.5	7108.8
Commercial (h = 4 mL)	7472.3	1868.1
Parking for residential use (h = 2,8 mL)	13,188.0	4710.0
Parking for commercial use (h = 2,8 mL)	26,376.0	9420.0
Parking at the free market (h = 2,8 mL)	13,188.0	4710.0
Public space (green + outdoor parking)		5285.0
Total	81,550.8	33,101.9

From the analysis of the current market for the area of reference, the following parametric market values for private building have been obtained (Table 2).

Table 2. Market values of the project area.

Intended Use	Market Value (euro/sqm)		
	Min	Average	Max
Residential	730	860	990
Commercial	790	995	1200
Reserved parking space	160	195	230

Finally, the construction cost of the project estimated today at 14,600,000.00 euro has been revalued, net of the value of the area. To the construction cost has been added an amount equal to 15% of the promoter's general expenses cost, for a total of approximately 16,800,000.00 euro.

Once estimated the cost of production it is possible to derive the parametric cost on square meters of useful project area, through a necessary homogenization operation (Table 3). In fact, since the building project is very articulated (a frequent feature in SH projects) and difficult to break down into lots that have a structural autonomy coinciding with the functional one (The various parts of the project characterized by different uses, both private and public, have common structural elements and appurtenances, such as foundations, etc.), it is not possible to determine the parametric unit cost for each single intended use. It follows that the parametric cost is an average homogenized cost, which does not highlight the due differentiation of the functional parts of the project, which will however be identifiable and expressed in the market value.

We proceed, therefore, by comparing the production cost of the work on the project quantities per single functional portion (residential, commercial and market parking use destinations), leaving out however those functional portions (green and public parking lots) that have no market cannot generate financial returns. It is clear, however, that the parametric cost contains within it also the cost necessary for the realization of urban planning standards.

Table 3. Homogenization of production costs.

Intended Use	Project Quantity		Average Production Cost	
	sqm	Incidence	Absolute Value	euro/sqm
Residential + parking lots	11,818.8	42.5%	€ 7,137,978.34	€ 603.95
Commercial + parking	11,288.1	40.6%	€ 6,817,419.57	€ 603.95
Parking at the free market	4710.0	16.9%	€ 2,844,602.09	€ 603.95
Total	27,816.9	100%	€ 16,800,000.00	

The average unit cost of the work is equal to 603.95 euro/sqm which, evidently, does not include the value of the land rent.

The construction times are estimated at around 7 years. The first year includes the executive planning phase and the authorization requirements; another three years for the construction phase up to the testing and a further three years that are probably necessary for the allocation of assets to the market and for the relative return of the investment capital to the developer.

3.2. The Appraisal of the Developer's Profit (UP)

The appraisal of the profit of the developer UP according to the model illustrated in the previous paragraphs requires the prior determination of the variation factor F, that is of the coefficient between the values 0 and 32 as the percentage share to be attributed to the value of the total cost of operation C, obtained from the sum of the production cost of the work and the cost for temporary housing, net of any co-financing by the public entity (see report (9)). In the present case, considering both the costs for temporary housing and the public co-financing, there will be no:

$$C = (Cp + Ctemp - Cpp) = 603.95 + 0{,}00 + 0{,}00\ 603.95 \text{ euro/sqm}$$

The value of F is estimated with the application of a multi-criteria analysis, assigning a score between 0 and 3 to the various criteria representing risk conditions in real estate investments (Table 4).

Table 4. . Rating scale for multi-criteria analysis.

Rating Scale
0 = zero risk
1 = low risk
2 = average risk
3 = high risk

The scores are attributed using the Delphi Method, through the expression of the judgment by a panel of experts of the appropriately selected local real estate sector. The members of the commission of experts will preferably be indicated by the various local institutional bodies of the Metropolitan City of Reggio Calabria: LLPP Office of the Municipality, Technical Office of the ATERP, Land Agency, National Association of Construction Builders, Professional Associations of Architects, Engineers and Surveyors. The role of facilitator is entrusted to the referents of the PAU Department project of the Mediterranean University.

In this discussion, which ranks prematurely with respect to the phases of actual implementation of the PPP project, a simple simulation of the attribution of scores in the multi-criteria model is proposed (Table 5).

Table 5. Application of the multi-criteria analysis.

Evaluation Criterion	Max Score	Average Evaluation of the Panel of Experts	Weighted Score
Context risk	2.909	1	0.97
Property risk	2.909	1	0.97
Renter risk	2.909	1	0.97
Liquidity risk	2.909	3	2.91
Financial risk	2.909	2	1.94
System risk	2.909	2	1.94
Insurable risk	2.909	0	0.00
Construction risk	2.909	2	1.94
Test risk	2.909	0	0.00
Management risk	2.909	1	0.97
Political risk, country and exchange risk	2.909	0	0.00
	32.000		12.61

On the basis of the report (6) it is possible to determine the unit value of UP:

$$UP = UPmin + C * F = 603.95 * 11\% + 603.95 * 12.61\% = 603.95 * 23.61\% = 142.57 \text{ euro}$$

3.3. The Appraisal of the Amount of Housing to be Allocated to SH

The District II Contract of Reggio Calabria did not provide for co-financing quotas for the specific intervention on buildings owned by ATERP, but only provided the building area with annexed building structures destined for demolition.

On the basis of the reports (12) and (14) it is possible to appraisal respectively the quantity of asset to be recognized in exchange for the developer at the end of the investment and the quantity to be allocated to SH (Table 6).

Table 6. Appraisal of the trade-in value.

	Residential	Commercial	Parking Lots
VMt	€ 950.00	€ 1,050.00	€ 195.00
C	€ 603.95	€ 603.95	€ 603.95
UP	€ 142.57	€ 142.57	€ 142.57
Vperm (C + UP)	€ 746.52	€ 746.52	€ 746.52

The generic formulation, however, can be applied for only one intended use at a time, since the algorithm does not simultaneously treat several variables relating to different market and cost values, which in turn depend on the type and destination of use. In the specific case, the recovery project for the ATERP lot is characterized by multiple uses (Table 7): 11,808.8 sqm for residential use, 11.288,1 sq m for commercial use and 4710.0 sqm of parking spaces. In this case, the Qperm and Qsh values for each of the intended uses must be calculated separately.

Table 7. Appraisal of the amount of Social Housing.

	Residential	Commercial	Parking Lots
Project data (sqm)	11,818.8	11,288.1	4710.0
Qperm (sqm)	9287.3	8025.5	18,031.3
Qsh (sqm)	2531.5	3262.6	−13,321.3

We will therefore have the following.

As can be seen from the results reported in Table 8, volumes that amounted to 24 million euro can be generated from the real estate operation on a completely disused area. Considering the investment costs of around 16.8 million, it can be deduced that the remaining portion (approximately 7.2 million euro) represents the total capital gain generated by the transaction, which in turn coincides with the land rent. This method, therefore, eludes the need for the difficult determination of the value of the abandoned and unproductive area.

Table 8. Distribution of capital gain.

	Residential	Commercial	Parking Lots	Breakdown Due
Real estate values (euro/sqm)	€ 950.00	€ 1,050.00	€ 195.00	
Qperm (euro)	€ 8,822,973.84	€ 8,426,743.76	€ 3,516,100.58	€ 20,765,818.18
Qsh (euro)	€ 2,404,917.83	€ 3,425,721.86	–€ 2,597,650.58	€ 3,232,989.11
	€ 11,227,891.67	€ 11,852,465.63	€ 918,450.00	€ 23,998,807.29

Based on the aims of the redevelopment program, it is clear that it is in the interest of the public entity to keep as much surface as possible to be used as SH residence, while it is in the private individual's interest to hold mainly commercial premises, which are also suitable for more flexible use (sale, leasing or own management) and parking (to be used for sale).

With a simple clearing operation based on real estate values, it is possible to transfer the amount of commercial and parking space to the developer in exchange for a corresponding share of residential housing allocated to the public entity. All to be completed with possible monetary adjustments (Tables 9 and 10):

Table 9. Distribution of capital gain.

	Residential	Commercial	Parking Lots	Compensated Allocation
Qperm (euro)	€ 7,994,902.56	€ 11,852,465.63	€ 918,450.00	€ 20,765,818.18
Qsh (euro)	€ 3,232,989.11			€ 3,232,989.11
Totale	€ 11,227,891.67	€ 11,852,465.63	€ 918,450.00	€ 23,998,807.29

Table 10. Determination of the balance value between public and developer.

	Breakdown Due	Compensated Allocation	Adjustment in Monetary Value
Qperm (euro)	€ 20,765,818.18	€ 20,765,818.18	
Qsh (euro)	€ 3,232,989.11	€ 3,232,989.11	
	€ 23,998,807.29	€ 23,998,807.29	

3.4. Verification of Financial Sustainability

Against a financial commitment of over 16.8 million euro for a period of 7 years, the investment produces the following nominal gross profit to the developer (Table 11).

Table 11. Investment indicators.

Financial transaction period (years)	7
Investment costs	€ 16,800,000.00
Costs for interest payable	€ 616,000.00
Revenues	€ 20,765,818.18
Total gross profit (not discounted, net of interest expense)	€ 3,349,818.18
Average annual profit (not discounted)	€ 478,545.45
Rate of return (UP profit but net of interest expense)	19.23%
Annual rate of return (UP profit but net of interest expense)	2.75%

This result is the product of an indirect analysis based on the ordinary values of the developer's profit derived from literary references, and from an analysis of the local context of the real estate market carried out by privileged stakeholders through the Delphi method. Both data carry with them any margins of error due respectively to:

- General scientific results removed from the actual market situation under study;
- Incorrect assessment by stakeholders called upon to interpret business risk in the local context.

The application of an inverse analytical procedure can confirm or not the validity of the previously performed analyzes. Therefore, a simulation of the financial flows generated by the operation is carried out from the point of view of the developer. In the DCFA the discounting coefficient is given by the WACC: in the simulation it is assumed that the developer, as financier of the work, may have to resort to credit capital at least for a portion. In the hypothesis that, under ordinary conditions, the developer has capital of its own only for a third of the total amount of the investment and that it must resort to the credit system for the remaining part, it is also necessary to appraisal the average cost of the capital referred to in the report (8) (Table 12).

Table 12. Determination of the WACC.

D	€ 402.63	amount of the developer's debt
E	€ 201.32	market value of equity
V	€ 603,95	total value of capital
Re	0.58%	cost of own capital: 7-year BTP income
Rd	5.50%	average cost of debt capital: average bank interest rate (TAEG)
WACC	3.86%	

The application of cash flow analysis returns the following evidently positive values (Table 13).

Table 13. Results of the financial analysis of the investment.

NPV	€ 1,142,650.43
IRR	6.54%

In fact, the IRR, which does not depend on the cost of capital (WACC) but on the whole of the non-discounted positive and negative flows, becomes a useful tool for comparison with the WACC. Therefore, since the IRR is greater than the WACC in the simulation, the former is certainly able to cover the cost of capital (WACC) generating an incremental wealth for the developer.

In cases where the IRR is lower than the WACC, the NPV is negative. However, it may happen that for some IRR values higher than the WACC, the NPV turns out to be positive but with values that are not high enough to attract private capital.

4. Discussion of Results

Sensitivity analysis is therefore important to verify the actual validity of the risk appraisal. In fact, re-proposing the whole simulation with UP values respectively of 11% and 43% of C, or the minimum and maximum of the profit of the developer, the following results were obtained (Table 14):

Table 14. Comparison of results with the max and min values of UP.

	Indicators	UP/sqm		
		€ 142.57	**€ 259.70**	**€ 66.43**
Values not updated	Total gross profit	€ 3,965,818.18	€ 7,224,000.00	€ 1,848,000.00
	Total rate of return	23.61%	43,00%	11.00%
	Annual yield rate	3.37%	6,14%	1.57%
DCFA	NPV	€ 1,142,650.43	€ 3,774,912.49	–€ 568,319.91
	IRR	6.54%	12.36%	2.48%
	IRR—WACC	2.68%	8.50%	−1.38%

From this it is clear that if the panel of experts had evaluated a risk value F equal to zero, the producer profit would be at least 11% (which in any case returns a positive annual rate of return higher than the yield of the BTP) would have been in any case insufficient for the financial feasibility of the intervention.

In truth the discriminating element that allows to establish with certainty that the UP, calculated as a percentage share of the production cost of between 11% and 43%, is sufficient to make the investment financially feasible for the developer, is the "time" factor.

Getting a certain rate of return from an investment in a single year has a certain meaning; getting the same return in ten years has a completely different meaning. It follows that the range between 11% and 43% of the Cp, inferred from the analysis of the scientific literature, is in itself insufficient and of little significance if it is not in any way related to the temporal datum investment. Probably the min and max range identified in the literature depends not so much and not only on the specific characteristics of the real estate operation fielded but rather on the time span that involved the whole process.

If this is true, the report (6) will assume the following conformation:

$$UPannual = (UPmin + CP * F)/T \quad (15)$$

where T = investment period expressed in years.

The condition to be verified is that the annual UP is greater than or equal to the average ordinary profit of the developer in the geographical area of reference.

The significant figure will be the annual return on the investment that will have to meet the developer's expectations based on the type of investment and the options of choice compared to other investment opportunities.

In the real estate sector, in particular, in ordinary market situations the expected returns fluctuate between 5% and 6% per year, but these could also be significantly different in more or less dynamic market conditions. In the case of Reggio Calabria the gross return recorded in 2015 was 4.5% [34].

It is therefore necessary to give a critical judgment of the value of the NPV (derived from the application of the DCFA) and of the annual rate of return which must be consistent with the values expected by an ordinary developer, in relation to the type of investment and the local context of reference.

In the event of results that are clearly inconsistent with expectations, it may be appropriate to reformulate the value of the risk according to one of the methods indicated by Damodaran [23], after a more careful analysis of the contextual conditions that influence the business risk.

In summary, the approach is to align the two members of the equation, and this can happen in two ways that are not necessarily alternative to each other:

1. Co-finance part of the intervention with public capitals, if available;
2. Increase the amount of UP (euro/sqm) in order to improve the exchange conditions.

At the moment it is difficult to reach a unified judgment on the effectiveness of evaluating the return on equity as a fraction of the cost of production rather than drawing on financial indicators.

It is therefore believed that research should still be carried out further, testing the reliability of the proposed model also by applying consolidated financial techniques such as, for example, DCFA. These techniques allow, in fact, to critically analyze the results of the simulations. The repeated analysis on various case studies and the related sensitivity analysis could clarify the reliability level of the proposed model.

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Article

Social Housing and Affordable Rent: The Effectiveness of Legal Thresholds of Rents in Two Italian Metropolitan Cities

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Abstract: Social housing is an instrument of housing policies to support those groups of people who are disadvantaged due to particular economic weaknesses and/or social relational fragility. Consequently, to achieve the objective of social sustainability, the rents of social housing must be below the market rents and low enough to be affordable. Italian law has set several rent thresholds which are based on local territorial agreements between landlords and renters associations. This article aims to examine whether these thresholds generate social fairness and housing affordability within each city and between different cities, or instead inequalities and spatial asymmetries. A cluster analysis is applied to study whether the goal of fairness is achieved, while the effectiveness of providing housing affordability is assessed by comparing the benchmarked rents with those of the national ministerial Real Estate Market Observatory. Two metropolitan cities—one in the north and another in the south of Italy—with different social and economic characteristics were chosen as case studies. The results show that variations in rents, location, and housing quality are fairly consistent within urban areas and cities. However, the benchmarked rents are not consistently related to the market rents and are often higher than the latter, failing to meet the provision of affordable housing that was the primary goal of the law.

Keywords: social housing; affordable rent; cluster analysis; social fairness

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1. Introduction

The purpose of social housing (SH) is to provide affordable housing to families who are having difficulty finding adequate housing for their needs at market prices, given that housing is a common good and a fundamental right [1–4].

SH is a complex multidimensional issue that concerns different fields of study (politics, sociology, ethics, economics, architecture, energy) at different scales (international, national, urban, construction) and involves several actors. Furthermore, SH can have very different characteristics with respect to its coverage in the territory, but also to the target households and the type of economic transaction.

In the literature, there are many studies dealing with housing policy instruments that can influence housing affordability and many topics concerning SH have been addressed at both the social and urban levels. From a social point of view, among the main aspects that have interested recent studies are the measurement of SH renovation programs [5] and the assessment of the social sustainability of urban regenerative actions related to SH projects, with particular attention to social cohesion and community involvement [6]. On the other hand, from an urban perspective, a great deal of research has been conducted on the energy efficiency of SH buildings, as SH providers exert a significant influence on large housing stock and thus offer several opportunities to address energy sustainability and carbon emissions [7,8]. Instead, interesting new urban perspectives have been investigated concerning the ability of public housing estate regeneration initiatives to create an "Outwards

Regeneration Effect" [9]. A number of studies have recently emerged highlighting the development of housing policies for low-income citizens in the particular socio-economic systems of African or Middle Eastern countries [10–12].

One of the most critical SH issues, however, is the economic one, in which must be found a balance between the economic feasibility of SH projects for investors, even in the presence of public–private partnerships [13], and the housing affordability for people on low incomes or in poor conditions [14,15]. In this regard, an evaluation model has also been developed to support the decision-making process for the realization of integrated urban regeneration programs linked to SH interventions, which is focused on the search for an economic balance between the interests of all the parties involved [16]. On the other hand, some authors have investigated the issue by, for example, identifying the trade-off between urban land rent and housing affordability [17] or, more generally, by exploring SH affordability, including through the residual income approach [18,19].

However, there is a lack of study on the methodologies for appraising SH rents, so that they are fair and affordable; that is, lower than market rents. To achieve these goals, according to Italian law, the maximum SH rents must not exceed certain legal thresholds, i.e., the benchmarked rents obtained by local territorial agreements between landlord and renter associations. Based on these assumptions and in order to fill this gap in the literature, this study aims to verify whether the Italian rule of law generates social equity and housing accessibility for all potential locations of SH, or instead generates inequalities and spatial asymmetries, since in Italy, there are many different SH rents within each city and between cities. The goal of fairness is investigated, as internal consistency of the rents within local territorial agreements is verified by implementing the cluster analysis, while the effectiveness of the benchmarked rents with respect to housing affordability is assessed by comparing these rents with those of the Ministero delle Entrate's Osservatorio del Mercato Immobiliare (OMI) [20]. The analysis is applied to two case studies, namely the Metropolitan City of Milan, in northern Italy, and the Metropolitan City of Bari, in southern Italy, which are representative of different economic, social, and territorial conditions.

The paper is structured as follows. In the next section, we provide an overview of social housing in the European Union and the United Kingdom. Section 3 explores the housing issue in Italy by describing territorial asymmetries in income, poverty, and housing finance. In Section 4, the two case studies are presented. Section 5 illustrates the methods. In Section 6, the main results of the case study are presented. A discussion of the results is provided in Section 7. Finally, some conclusions and recommendations are suggested.

2. Social Housing in the European Union and United Kingdom

Social housing is distributed very differently across the European Union countries and the United Kingdom (Figure 1), depending on citizens' wealth, local housing tenure, and the social policies of each country [21].

For example, the percentage of SH in the stock of residential properties varies from 30% in the Netherlands to only 2% in Portugal. In Italy, on the other hand, the average percentage is quite low at 4%. Moreover, it is worth mentioning that big cities or metropolitan areas are the places where the scarcity of affordable housing is mostly concentrated and that have to face social problems and spatial inequalities. Again, the incidences vary widely in the European countries, even among cities in the same country, with a high share in Amsterdam (NL), Manchester (UK), and Aarhus (Denmark) and the highest percentage in Linz and Vienna (Austria), at 54% and 43%, respectively [21]. Thus, it shows that there is no direct correlation between the percentage of SH in the stock of residential properties and the percentage of the population at risk of poverty in the total population. This depends on past and current social policies and the choice of tools to provide housing affordability, e.g., rental or purchase subsidies, tax exemptions, etc.

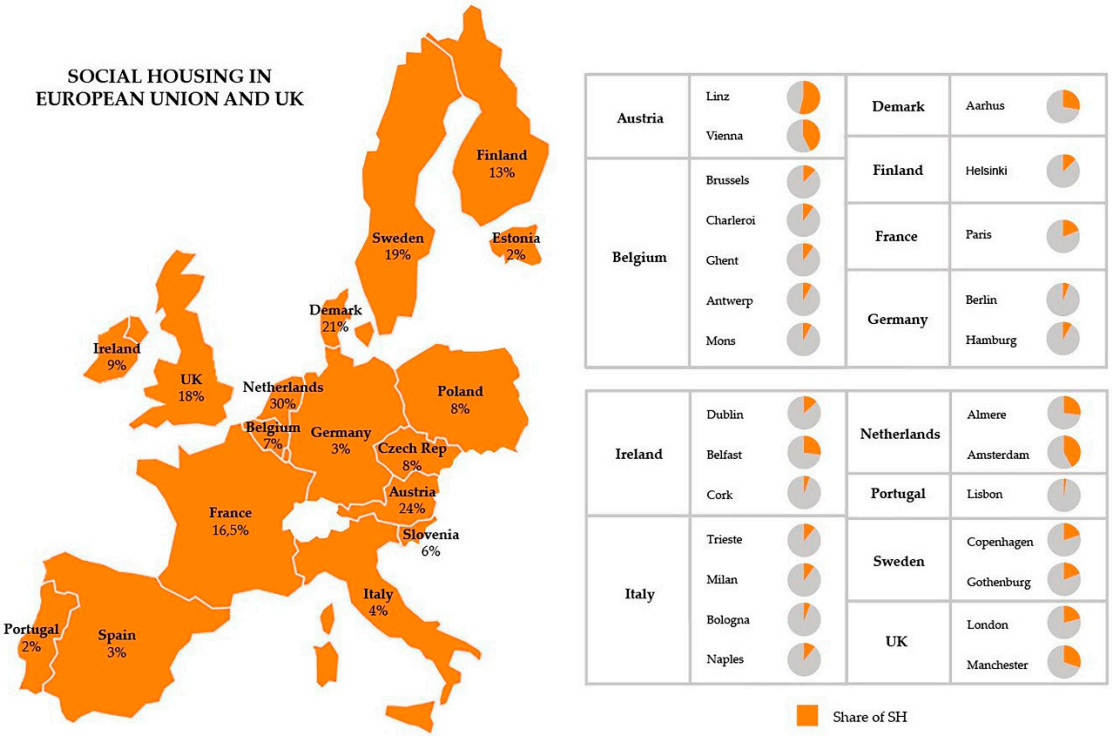


Figure 1. Social housing in the European Union and the United Kingdom in 2019 (source: Housing Europe).

In addition, in some European countries, SH is aimed at specific social groups according to the income level or particular social conditions of fragility—such as young low-income couples or elderly people living alone—or it may be targeted at all citizens who submit an application for a housing assignment.

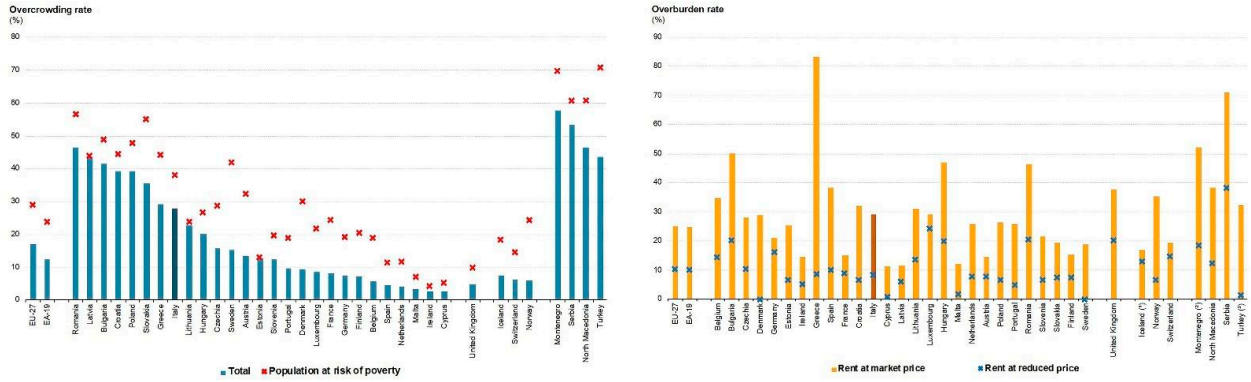
Because SH must meet the demand for different types of economic transactions, such as the temporary or long-term rental of housing, or the immediate/deferred purchase of the housing unit, it is consequently necessary to establish standards and thresholds to be used in appraising rents and sales prices for all required transactions. Providing public or social housing is an essential welfare action as millions of households in Europe are in need of decent housing at an affordable price and are at risk of poverty (namely, the population whose income is less than 60% of national income median equivalized disposable income).

With specific reference to the SH rental, rent appraisal has a large social and economic impact, as rental housing makes up a significant share of the housing market. In fact, in 2019, around three tenths (30.2%) of the EU-27 population lived in rented dwellings, although this share ranged from 4.2% in Romania up to 58.4% in Switzerland. According to the housing statistics by Eurostat [21], this range depends on the distribution of tenure status between landlords and tenants and is deeply embedded in the social system of every country. For instance, in Romania, there is a high percentage of homeowners (95.8%), even though it is associated with a high rate of overcrowding (46.3%), especially for the population at risk of poverty (56.4%).

In more detail, the EU-27 tenants can be sorted in two groups: those living in rented dwellings with a market-price rent or with a reduced-price rent, 21.1% and 9.1%, respectively. The latter share was very low (less than 5%) in 8 of the EU Member States, e.g., 0.8% in Netherlands and 0.9% in Sweden; by contrast, it was around one fifth in Ireland (22.3%) and Slovenia (19.3%).

In 2018, around a third of the EU-27 population were tenants with market price or in reduced rent (20.8% and 9.3%), while they were respectively 18.8% and 8.8% of the Italian population. Another critical point is the quality of housing, as the proportion of people living in an overcrowded dwelling was 17.1% in the EU-27, while it was 27.8% in Italy.

Furthermore, among the people at risk of poverty, the overcrowded rates were even higher, reaching 28.9% in the EU-27 and 38% in Italy (Figure 2a) [22].



(**a**) (**b**)

Figure 2. Overcrowding (**a**) and overburden (**b**) housing rates in EU-27 and other countries in 2018 (source: Eurostat).

With regard to housing affordability and looking at the population whose housing costs exceeded 40 % of their equivalized disposable income, the proportion was 25.1% for tenants with market price rents and 10.2% for tenants with rent at reduced market price. These rates differ in Italy: the former was worse as it reached 29.1%, the latter was better as it was 8.3% (Figure 2b) [22].

The appraisal of SH rent must therefore take into account two conflicting objectives: the financial sustainability of the investors, i.e., the rent must be high enough to make the real estate investment feasible in comparison to the expected private and/or public return objectives; and the social sustainability of households, i.e., the rent must be significantly lower than market rents and, in any case, must be low enough to be affordable for the income level of the households.

3. Housing Issue in Italy

3.1. Rules of Law and Funding of Social Housing

In Italy, social housing, known as edilizia residenziale sociale (ERS), aims at satisfying the housing demand of certain target social households, identified on the basis of their socio-economic profile or of specific conditions of vulnerability and discomfort. These households, while not being able to access the real estate market, are able to afford moderate rents or reduced purchase prices. SH is a middle ground, then, between market housing and public residential housing (ERP) which is publicly owned and intended for rental to low-income households. SH projects, therefore, provide new or renovated housing with good technological and energy-efficient features, located in redeveloped urban areas at an affordable price [23].

The social groups that can apply for SH units in Italy are:

- low-income households, including single-parent or single-income households;
- young low-income couples;
- elderly people in socially or economically disadvantaged conditions;
- commuter students;
- households subjected to eviction;
- other households (according to articolo 1, legge n. 9, 8 febbraio 2007); and
- low-income legal immigrants who have resided in the country for at least ten years or at least five years in the same region.

SH projects can be financed by non-reimbursable public contributions, by private investments or by mixed public/private capital also coming from Real Estate Funds. In Italy, an important role is played by the Fondo nazionale di Investimenti per l'Abitare (FIA),

managed by Cassa Depositi e Prestiti—Società di gestione del risparmio (CDPI Sgr), which was activated in 2009 by the Sistema Integrato dei Fondi immobiliari per l'housing sociale (SIF) provided in the Piano Nazionale di Edilizia Abitativa (DPCM of 16 July 2009). The function of the FIA is to facilitate, with its capital, the establishment of local real estate funds for SH projects that can be promoted by local actors (Figure 3) [24–26].

Figure 3. Social housing funds in 2020 (source: Battaglia 2020).

These real estate funds provide an important economic and social impact because they promote collaboration between public and private stakeholders and, above all, because they constitute "ethical investments" that follow objectives of social solidarity and environmental sustainability. As a result of the social aims of the projects, that is the provision of affordable housing, the expected rate of return on these real estate funds is 3% above the rate of inflation, i.e., it is a positive and low rate but is however in line with the return on long-term, low-risk real estate investments. In addition, FIA selects projects for funding not only on the basis of the quality of the buildings but also of environmental sustainability, both in terms of energy efficiency of the buildings and minimization of land consumption. In fact, priority is given to urban regeneration projects that redevelop brownfields, reuse existing buildings, and create new functional and social connections in the neighborhood.

3.2. Territorial Asymmetries of Social Housing

From 2009 to 2017, FIA promoted several local real estate funds (31 deliberated funds and 27 subscribed funds) establishing a constrained investment of €1733 million in 275 initiatives and planning to invest another €619 million. These initiatives created an SH offer of about 2 million sq.m (Figure 3) and a mix of uses such as temporary housing, open market housing, commercial space, and services. In order to meet the demand of many families living in relative poverty due to the cost of market-rate housing corresponding to a high percentage of their income, an SH offer was designated in advance for rent-reduced units (65%). The percentages allocated to lease with the right of redemption and sale at reduced price are lower, at 18% and 17%, respectively, and respond to the demand of those who wanted to buy a house but had difficulty in finding suitable housing on the market at an affordable price concerning their income level (Figure 4) [24].

The construction of social housing, intended as a tool to support equalization policies, is an opportunity to rebalance social inequalities even if the SH supply is far lower than the overall demand and is not equally distributed in the Italian regions. This results in two forms of territorial asymmetries:

- one at an inter-regional level among people living in cities where there is an existing/absent SH offer; and
- one at an intra-urban or metropolitan level among the inhabitants of cities where there is an SH offer, as not all eligible persons are able to access SH due to the scarcity of supply.

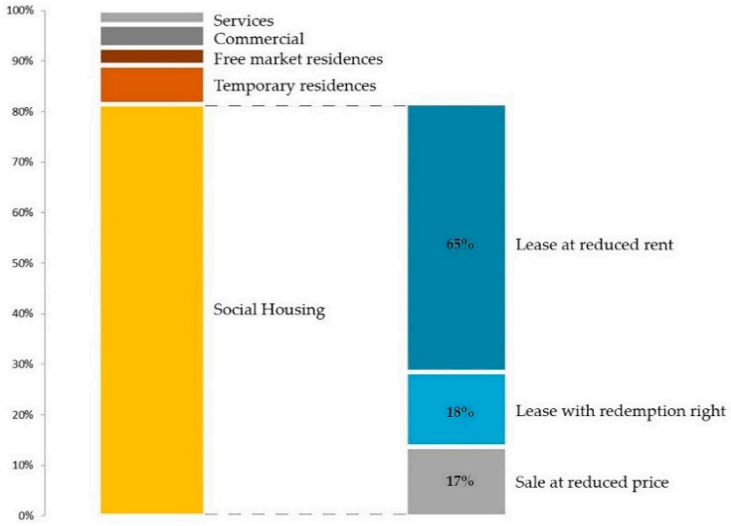
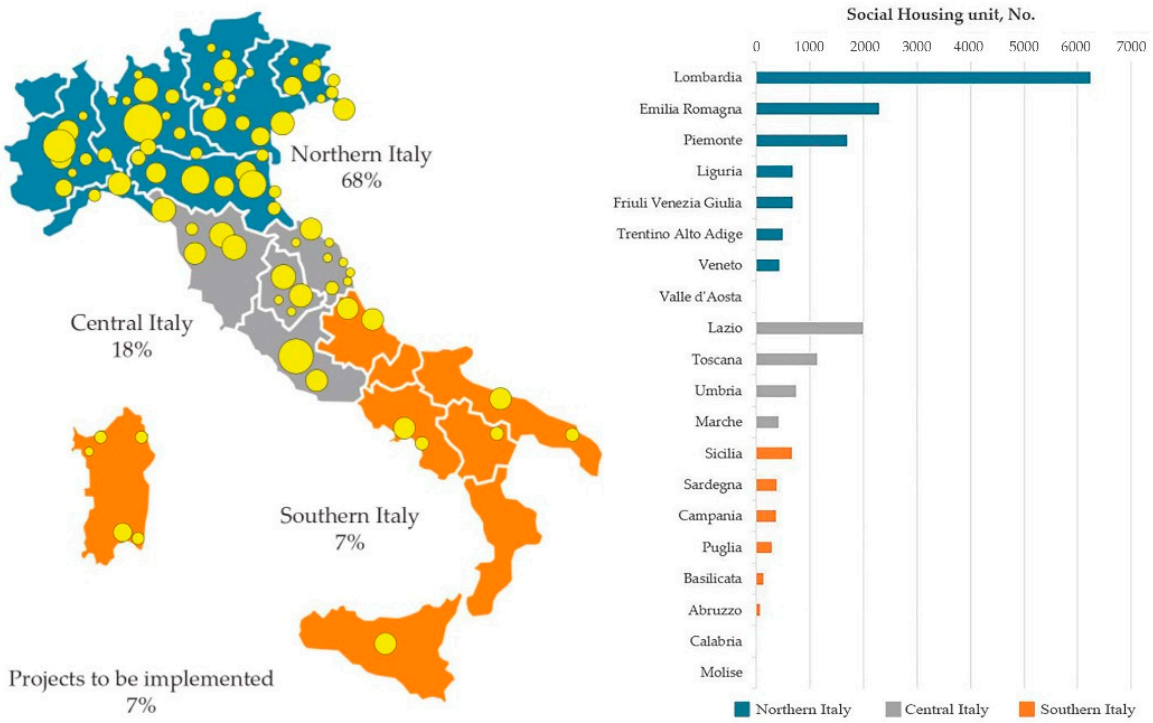


Figure 4. Functional mix in social housing and types of lease in 2020 (source: Battaglia 2020).

The analysis of the distribution of SH projects makes clear the degree of territorial asymmetries between three geographical areas, northern, central, and southern Italy (Figure 5a) [27]. In fact, 68% of investments are concentrated in northern Italy, while the regions that have benefited most from the possibilities of FIA co-financing are Lombardy, Emilia-Romagna, and Piedmont [25], but also Tuscany and Lazio. These regions have a dynamic economic system and are more inclined to the adoption of innovative financial instruments and new types of real estate investment. On the other hand, FIA co-financing was used with considerable delay in southern areas, where there were few SH projects (Figure 5b).



(**a**) (**b**)

Figure 5. Territorial distribution of SH interventions financed by the FIA by geographical area (**a**) and of SH units by region (**b**) (source data: CDP Investimenti SGR, 2016).

Although Italy is a country where the percentage of households living in a house owned is rather high (68.1% in 2016 according to the Bank of Italy), 20.4% of Italian households live in rented accommodation and may have difficulties accessing housing (the remaining share of households have accommodation in different ways such as usufruct, free title, etc.) [28].

There are two areas of problematic access to housing:

- the first is the absolute housing emergency which concerns individuals in absolute poverty (4.6 million people and 1.6 million households in 2019) who do not have the resources to live adequately. These people would be entitled to public housing;
- the second is the housing discomfort of those who are in relational poverty (8.8 million individuals and 2.9 million households in 2016) as, despite having a low to medium income, they cannot find adequate housing for their needs in the housing market. These people may require SH housing (Figure 6) [29].

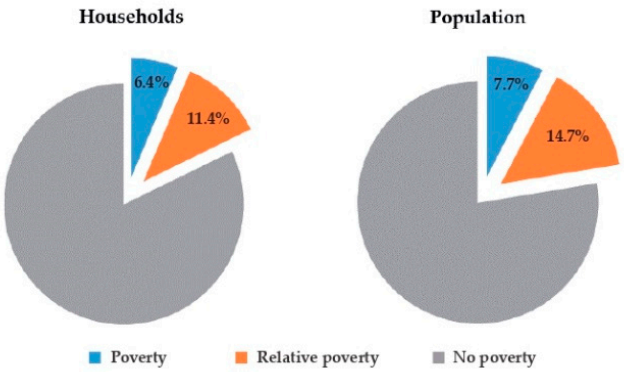


Figure 6. Absolute and relative poverty of households and population in Italy in 2019 (data source: ISTAT).

There are several factors that determine the demand for SH:

- economic factors concerning income level or the need to relocate for work;
- social factors concerning the changing composition of families, particularly as the number of single-person and single-parent families has increased in recent years due to an increasing number of separations/divorces and elderly lonely people. In addition, young people find it difficult to move on their own due to the absence of stable and well-paying jobs;
- demographic factors related to the high percentage of foreigners in precarious employment.

With particular reference to economic factors, it should be highlighted that in Italy, there is a historical gap between the level of wealth of the southern regions and that of the northern regions, as can be seen from an analysis of economic data [30]. For example, if the percentages of GDP and population on a regional basis are compared (Figure 7), it appears that the economic system of southern regions has a structurally low capacity to produce wealth with respect to the resident population, while the contribution of the northern regions to GDP is predominant. In addition, an analysis of the distribution of taxpayer income by geographic area shows the marked prevalence (in percentage terms) of low (€0 to €15,000/year) and medium-low (€15,000 to €26,000/year) income brackets in the southern regions, while the northern regions have the highest percentages of high and medium-high income taxpayers (Figure 8a). The same data in absolute value show that there is a high concentration of low-income taxpayers in Lombardy (northern Italy), even if this depends on the high population of this region on a national basis (16.6% of the Italian population lives in Lombardy) (Figure 8b). The result is that affordable housing is a concern in southern Italy but needs to be addressed in northern Italy as well.

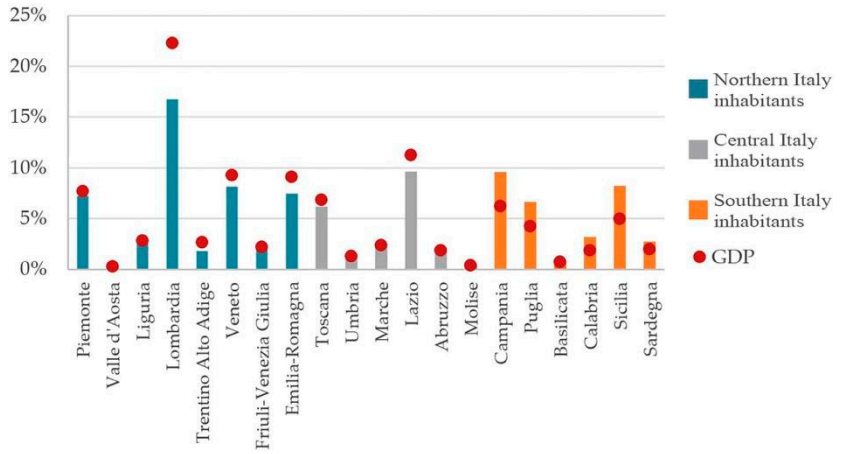
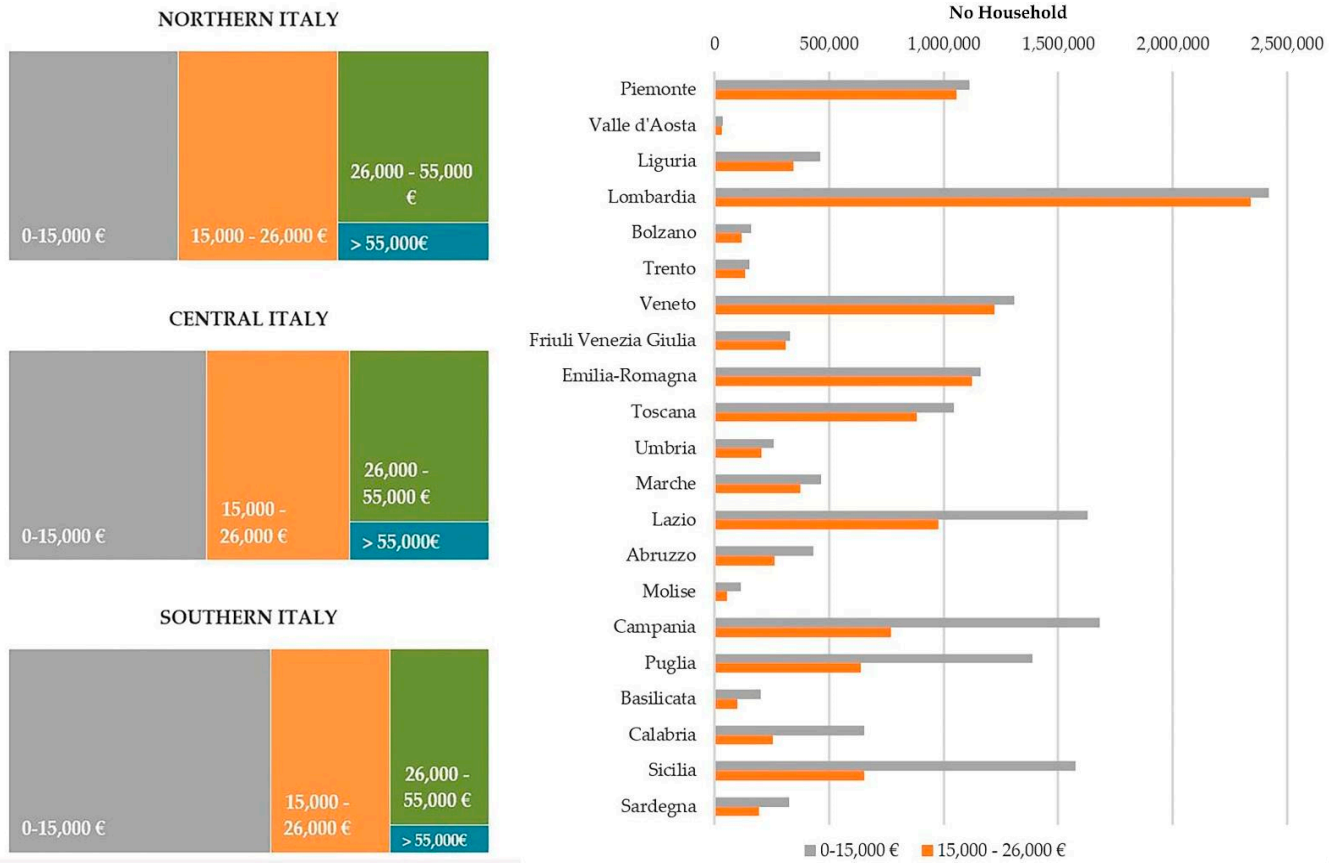


Figure 7. Percentage of inhabitants and gross domestic product (GDP) by Italian region (source: ISTAT 2019).



(**a**) (**b**)

Figure 8. Taxpayers by annual income brackets and geographical area (**a**); by low and lower middle income and by Italian region (**b**) in 2019 (source: ISTAT).

3.3. Eligibility of Householders for Social Housing

Italian housing policy is regulated by national laws that are supplemented by regional laws, as local administrations can independently establish some rules for the SH provision. The categories of people who can apply for SH units are similar in different Italian regions, but other relevant factors to achieving social equalization can vary significantly, for example: maximum income of applicants, agreed rents, agreed sale prices [31].

Local governments establish the economic and social requirements of the categories eligible for social housing and publish public notices that usually contain:

- list of the eligible categories (elderly, young couples, single-income households, etc.);
- income limits of the applicant (usually the total income of the members of the household with some detractions);
- characteristics and dimensions of the housing in relation to the number of the household members and, sometimes, description of spaces serving the housing (common areas, gardens, parking, etc.);
- conditions of leases, leases with covenants of future sale or sale of SH units (duration of the lease, payment of deposits, etc.);
- rents, lease with future sale covenants or sale prices of housing, determined in relation to regional as well as national legislation, and thresholds that such rents may not exceed; and
- criteria for the formation of rankings of beneficiaries.

As an example, Table 1 shows some of the economic data contained in a 2019 call for public housing in the city of Bari (southern Italy) [32], including the household's income range of 7680 to 45,779 euros/year as a requirement for participating in the call. In contrast, in a similar announcement in the city of Milan (northern Italy), income ranged from 7000 to 16,000 euros. This difference exemplifies the discreteness and variability of the local management of SH offerings.

Table 1. Economic data of a notice for the allocation of SH units in Bari (2019) (source data: Bari Social Housing).

City and Neighborhood	Household Income Thresholds		Housing Unit Size		Agreed Rents			Agreed Rent with Redemption Right
	Min €/year	Max €/year	Min Sq.m	Max Sq.m	Min €/year	Max €/year	€/sq.m year	€/sq.m year
Bari—Santo Spirito	7680	45,779	40	54	2560	3456	64	94
			62	73	3968	4672		
			75	91	4800	5824		

3.4. The Agreed Rents as Threshold Benchmarked Rents

Social housing rents must meet several requirements: affordability, i.e., be lower than market rents; and fairness, i.e., take into account the different conditions of the housing market in Italian cities; but also ease of updating over time. The Italian legislation established that the reduced rents of SH cannot be higher than certain legal thresholds and chose as thresholds the agreed rents that are set each year by local agreements between landlords and tenants associations.

The local agreements for agreed rents are regulated by the Decree of the Minister of Infrastructure and Transport (Decree 16 January 2017) according to art. 2 paragraph 3 of Law 431 of December 9, 1998 [31]. The local agreements are promoted by the municipalities, which summon the national associations of landlords (e.g., Assoedilizia, Federproprietà, etc.) and tenants (e.g., SUNIA, CONIA, etc.). The associations agree on the subdivision of the areas of the municipal territory into "homogeneous urban zones", as well as on the building types and the agreed rents. In each zone, the maximum rent for SH (art. 2 paragraph 3, Decree of the Minister of Infrastructure and Transport of 22 April 2008) is included in a minimum–maximum range depending on the characteristics of the property, such as building type, state of maintenance, technical facilities (elevator, energy class, etc.), condominium services (communal garden, parking space, etc.), or private (private garden, terrace, etc.). Since the landlord who rents by agreed rents gets tax breaks, as some taxes are reduced and others are exempted, the range of minimum and maximum rent must be lower than the market range.

Therefore, these local agreements are themselves a housing policy tool because they incentivize the supply of affordable rental housing. In addition, the agreed rents have been used by the law to set the highest benchmarked rents for SH.

4. Materials: The Metropolitan Cities of Milan and Bari (Italy)

As a case study, the metropolitan cities of Milan and Bari were chosen because they are representative of different social and economic contexts (Figure 9) [33]. Milan is located in northern Italy in the Lombardy region, where the highest percentage of the Italian population lives and where the most important economy in Italy is present, given that it alone produces more than a fifth of the GDP. Bari is in Puglia, in southern Italy, where a small part of the population lives (6.65%) and where only 4% of GDP is produced (see Figure 7). It should be noted that the current "metropolitan cities" were established in 2015 (Law No. 56 of 7 April 2014) and replaced the pre-existing provinces.

Figure 9. Location of the two case studies in Italy.

The Metropolitan City of Milan has an area of 157,565 km^2 (6.60% of the regional area) and is composed of 133 municipalities. In 2019, there were 3,250,077 inhabitants (30.08% of the regional population), of which 1,395,980 lived in Milan, which is the capital city. The Metropolitan City of Milan has an excellent infrastructure system and connection with other European states and, in 2014, the GDP per capita (nominal) was €46,128/year, higher than the national average GDP per capita, which in 2014 was €35,518 (Table 2) [34,35].

Table 2. Statistics of metropolitan cities of Milan and Bari in 2019 (source: ISTAT).

	Metropolitan City of Milan	**Metropolitan City of Bari**
Geographic area	Northern Italy	Southern Italy
Region	Lombardia	Puglia
Capital city	Milan	Bari
Municipalities (No.)	133	41
Area (km^2)	1575.65	3825
Percentage of regional area (%)	6.60%	19.57%
Area of the capital city (km^2)	181.67	116.17
Inhabitants (No.)	3,250,077	1,234,997
Percentage of regional inhabitants (%)	30.08	32.19
Inhabitants of the capital city (No.)	1,395,980	316,491
Pro-capite GDP * (€/year)	46,128	22,319

* data year 2014.

The Metropolitan City of Bari has an area of 3825 km^2 (19.57% of the regional area) and is composed of 41 municipalities. The population in 2019 was 1,234,997 (32.19% of the regional population), of which 316,491 lived in Bari, which is the capital city. In 2014, the GDP per capita (nominal) of the Metropolitan City of Bari was €22.319/year, less than half that of the Metropolitan City of Milan and lower than the national average GDP per capita, so it is indicative of an underperforming economic system (Table 2) [34,36].

In the Metropolitan City of Milan, 42 municipal administrations, including that of the capital, signed local agreements in the years 2018–2020 according to the current law. Therefore, agreed rents were set and differentiated by municipality, micro-area, and characteristics of the dwelling. This provides insight into the highest rent threshold that can be applied to potential SH interventions in municipalities in the metropolitan area to assess their economic and social sustainability. The case study includes 38/42 towns (Figure 10). On the other hand, in the Metropolitan City of Bari, 41 municipal administrations, including that of the capital city, signed local agreements. Fourteen out of forty-one towns are part of the case study [37].

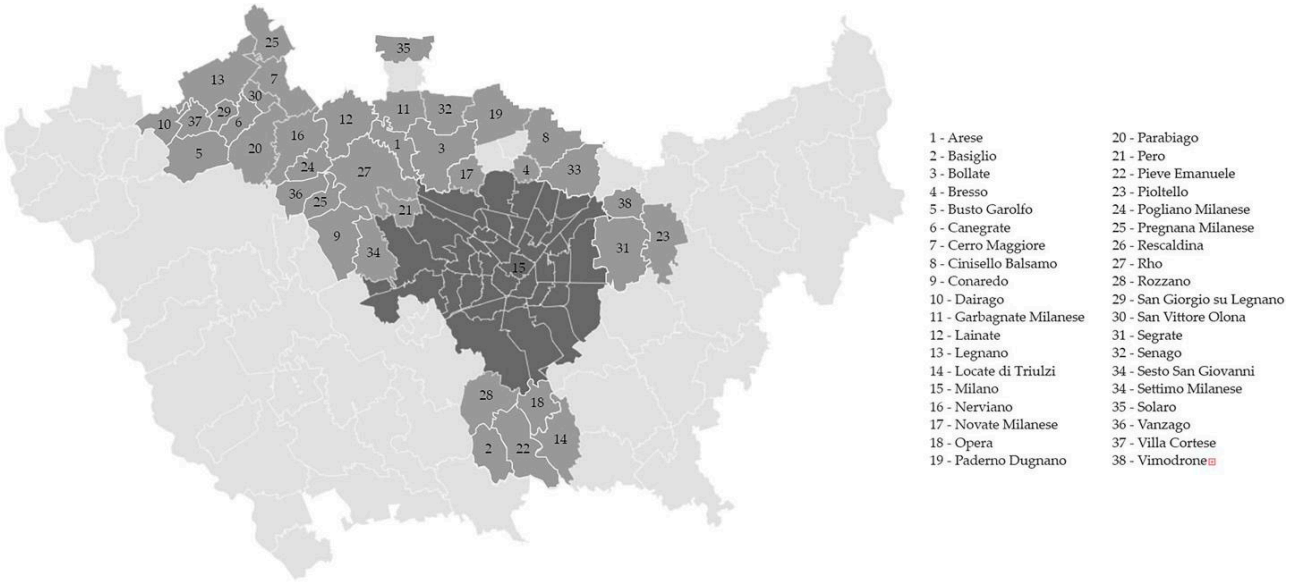


Figure 10. Towns of the case study of the Metropolitan City of Milan.

Each municipal administration has divided its territory into zones called "microzones" with a range from 1 (single zone) to 12 (in Milan). In each zone, rents were divided into 3 levels, i.e., sub 1, sub 2, and sub 3, concerning the characteristics of the dwelling, for an overall total of 314 agreed rents.

5. Methods

5.1. General

The proposed method aims to verify that the agreed rents set in each municipality by local agreements between landlord and tenant associations have both internal and external consistency. This is necessary because, according to the current law, the agreed rents are used as threshold rents for SH units. Internal consistency implies that the rent is fair, and it is achieved if agreed rents correspond to the different characteristics of cities, areas, and housing. External consistency implies that rents are affordable, and it is achieved if agreed rents are significantly lower than market rents.

If, on the one hand, the fragmentation of agreements and the high number of agreed rents are indicative of great flexibility and adaptation to the characteristics of each area and municipality, on the other, they can be an element of weakness and lead to inconsistencies or inefficiencies during the negotiation phase.

Verification of the internal consistency of the agreed rents is obtained by applying cluster analysis, which defines groups of municipalities with similar characteristics, to the data set of local agreements. External consistency is analyzed by comparing the agreed rents with rents collected by the Ministerial Observatory of the Real Estate Market (OMI) to verify their effectiveness as SH rents.

The method consists of the following steps:

- Construction of a database with data from municipalities and local agreements, such as characteristics of municipalities, agreed rents by municipality, zone, and sub-zone;
- Segmentation of the housing market through cluster analysis;
- Analysis of the internal coherence of the agreed rents by the semantic categories of differentiation of the attractiveness of MACBETH (Measuring Attractiveness by a Categorical-Based Evaluation Technique);
- Comparison of agreed rents with OMI rents.

5.2. Database

The study proposes an analysis of the agreed rents between landlord and tenant associations aimed at verifying the coherence in the implementation of SH policies in this specific area of application. The areas of analysis proposed in this study are those of the metropolitan cities of Milan and Bari.

These areas were selected to respond to the need to highlight the performance of SH policies in territorial contexts characterized by different socio-economic systems (see Figures 7 and 8).

The local agreements of the municipalities of the two metropolitan cities of Bari and Milan subject to analysis involve areas heterogeneous in location compared to the two capital cities of Milan and Bari for socio-economic characteristics such as population density and income, and for real estate characteristics including the rent.

In the construction of the database to support the analysis in order to grasp the peculiarities of the two areas under study and the agreed rents, it was chosen to select the following variables: (1) the minimum annual rent as it is considered more significant with respect to the income threshold for housing affordability; (2) the minimum real estate characteristics because they are consistent with the minimum rent; (3) territorial accessibility; (4) the population density of the municipalities; (5) the population group with income between 15,000 and 26,000, which is considered more significant with reference to the threshold income for housing affordability.

5.3. Segmentation of the Housing Market

Since the 1940s and 1950s, US researchers have developed "filtering models" to explore local housing systems. Filtering models can support a rigorous analysis of the real estate market, allowing the identification of distinct market segments. Sub-markets can be defined on the basis of housing location in the urban context (spatial submarkets), real estate characteristics (structural submarkets), socio-economic characteristics of households, and environmental factors.

William Grigsby [38] first defined the sub-markets in terms of "tight substitutability" of housing. Some researchers, according to this perspective, consider the real estate sub-market as consisting of an n number of properties "close substitutes" belonging to the same group, but "imperfect substitutes" of those belonging to other sub-markets.

Several models have been proposed in the literature to identify and analyze sub-markets such as Hedonic pricing models [39,40], factorial analysis [41], cluster analysis [42,43], geostatistical models [44,45], and Fuzzy clustering [46,47]. Cluster analysis is a widely used approach in the literature as an instrumental filtering model to identify real estate market segments.

We decided to use two filtering models for our analysis in order to delineate the SH sub-markets. The first segmentation model uses cluster analysis, the second further delineates the segments by classifying them based on the semantic categories of differentiation of the attractiveness of MACBETH.

In this study, the cluster analysis supports the verification of the internal coherence of the agreed rents between associations of landlords and tenants. This verification is aimed at highlighting whether the SH policies are implemented consistently in the different cities and their sub-zones.

5.3.1. Cluster Analysis

Cluster analysis is a multivariate statistical technique, through which it is possible to obtain a group structure from a certain population of data, that is, by grouping several similar units together in a certain number of groups.

The identified groups are characterized by being relatively homogeneous within them and heterogeneous among them. Homogeneity and heterogeneity are assessed on the basis of a defined set of variables. Grouping methods include traditional and fuzzy ones. In the first case, the objects belonging to a given group are selected by similarity (hard clustering), i.e., the "similar" objects are found in the same cluster. In the second case, the grouping of objects is carried out on the basis of modulation of the degree of similarity (even partial) (soft clustering).

Among the algorithms cluster proposed in literature of hard clustering type, the one based on the k-medoids was selected because it lends itself better to the purpose of the study that has the objective of verifying how similar the implementation of the SH policy in a city and in sub-areas of cities is.

The k-medoids algorithm allows you to partition the dataset into groups based on the minimum sum of the differences from a point identified as the center of the cluster. This point is characterized based on the selected analysis variables, namely, minimum annual rent, minimum real estate characteristics, territorial accessibility; population density of the municipalities; and population group with income between 15,000 and 26,000, cities and their sub-zones.

In this study, we used the Partitioning Around Medoids (PAM) algorithm proposed by Kaufman and Rousseeuw, a detailed analysis of which can be found in the literature [48,49]. In this study, we used the NCSS statistical software for cluster analysis.

5.3.2. K-Medoid Algorithm Cluster Validation

The term cluster validation is used to design the procedure of evaluating the goodness of clustering algorithm results. It is an important step to avoid falling into the trap of finding patterns in a random data, as well as, in situations where the efficacy of clustering algorithms is compared. This step is arguably the most challenging one in the clustering process. The resulting clusters of any clustering algorithm are almost entirely dependent on the measure and distance criterion decided on and, therefore, are subjective. Hence, an objective validation process is required to prove that the number of clusters is optimal and that the clusters themselves are meaningful.

Two of the most difficult tasks in cluster analysis are deciding on the appropriate number of clusters and deciding how to tell a bad cluster from a good one. Kaufman and Rousseeuw [49] define a set of values called silhouettes that provide key information about both of these tasks.

One useful summary statistic is the average value of s across all objects. This summarizes how well the current configuration fits the data. An easy way to select the appropriate number of clusters is to choose that number of clusters which maximizes the average silhouette. The maximum average silhouette across all values of k is denoted by SC.

Kaufman and Rousseeuw [49] proposed the following SC values to identify the appropriate number of clusters and decide how to distinguish a bad cluster from a good one.

- 0.71 to 1.00: a strong structure has been found;
- 0.51 to 0.70: a reasonable structure has been found;
- 0.26 to 0.50: the structure is weak and could be artificial. Try other methods on this database;
- −1 to 0.25: no substantial structure has been found.

5.4. Analysis of the Internal Coherence of the Agreed Rents

In order to explore the internal coherence of the agreed rent belonging to a specific cluster, the clusters identified with the k-medoid are subjected to further filtering based on the semantic categories of differentiation of the attractiveness of MACBETH [50]. This analysis aims to identify the internal similarity of a cluster. Based on the distance of each object from the cluster it is possible to assign each of them in the semantic categories of MACBETH: extreme, very strong, strong, moderate, weak, very weak, and no difference.

This analysis allows to classify agreed rents in those characterized by good coherence and those by low coherence, offering a good support to verify the coherence in the implementation of SH policies in two metropolitan cities.

5.5. Analysis of the External Coherence of the Agreed Rents

To explore the external consistency of the agreed rents, they were compared to the OMI database that collects quotations and rents in the OMI zones of all Italian municipalities.

To make the comparison, it is necessary to find the spatial correspondence between the zones of the local agreements and the OMI zones. Then, the differential between the agreed rents and the OMI rents can be calculated.

6. Application and Results

6.1. Rental Local Agreement Survey

Based on the survey of the local agreements of the municipalities in the two metropolitan cities, Milan and Bari, two databases were built with reference to five variables aimed at supporting the verification of coherence of the agreed rents: (1) minimum annual rent, (2) minimum real estate features, (3) accessibility, (4) population density, and (5) percentage population group with income between €15,000 and €26,000.

The agreed rents identify within each "homogeneous urban zone" (Zone 1—Central, Zone 2—Semi-central, and Zone 3—Peripheral) the band of fluctuation with a minimum limit value and a maximum limit value of the rent expressed in €/sqm per year.

Each band of fluctuation by homogeneous urban zone is divided into three sub-zones, in which the minimum and maximum values of the rent are included within the limits of this band.

The sub-bands of oscillation for each homogeneous urban zone are delimited with reference to the objective characteristics of the property and are identified in types A, B, C, and D (Table 3).

Table 3. Characteristics of groups and subgroups in the homogeneous zones.

Group	Subgroup	Characteristics
Type A	A1	Internal bathroom completes with all elements (cup, sink, bathtub or shower) and with at least one window or mechanical ventilation device
	A2	Essential and functional technological systems: Drinking water supply; plant prepared for the installation of the water heater; electrical system; gas system
Type B	B1	Habitable kitchen with at least one window
	B2	Lift for living units located on the 2nd floor or upper floor
	B3	Normal maintenance status of the building unit and for all its constituent elements: technological systems, fixtures, floors, walls, and ceilings
	B4	Technological systems complying with the sanitary and safety regulations in force on the date of conclusion of the agreed rent
	B5	Central heating or autonomous

Table 3. *Cont.*

Group	Subgroup	Characteristics
Type C	C1	Double bathroom of which at least one complete with all the elements (cup; sink; bathtub or shower) and with at least one window or mechanical ventilation device
	C2	Garage or carport (exclusive or shared)
	C3	Communal garden
	C4	Good maintenance status of the real estate unit and for all its constituent elements: technological systems of the house, fixtures, floors, walls, and ceilings
	C5	Normal maintenance status of the building and for all its constituent elements: common technological systems, facades, roofs, stairs, and internal common zones
	C6	Armored doors and double glazing
	C7	Proximity of the house to all services: Metro station, tram network, shops, and social services
Type D	D1	Presence of accessory elements: Balconies or terrace
	D2	Presence of functional elements: Cellar or attic
	D3	Apartments with an age of less than 30 years, except for buildings of value, although not bound by law
	D4	Absence of specific sources of environmental and noise pollution
	D5	Exterior view of value
	D6	Private garden or exclusive open space
	D7	Uncovered parking space
	D8	Apartments that in the last 10 years have been the subject of building intervention maintenance for which is required the declaration in the municipality of the beginning of activity (SCIA—Signaling Certified Beginning Activity)
	D9	Terrace of more than 20 square meters

For the identification of the sub-bands of oscillation, for each of them, the following composition of the characteristics of the housing must occur:

- sub-zone 1: (a) if only one of type A elements is missing or if cadastral type A/5 is missing; (b) if, equipped with heating system, also by stoves in the individual rooms, except for buildings that have at least four type B elements; (c) if housing units have less than three Type B elements, but all Type A elements.
- sub-zone 2: (a) if housing units have all the elements of type A and at least three elements of type B; (b) if they have all the minimum elements of type A and B, required for sub-zone 2, and less than three elements of type C.
- sub-zone 3: if housing units have all the elements of type A, at least three elements of type B and three elements of type C and in any case cannot be placed in this sub-zone the buildings if of cadastral type A/3 (of class 1, 2, 3), A/4 and A/6.

The presence of at least five of the elements of type D, implies the possibility of applying to the housing unit the maximum value of the rent in the sub-zone to which it belongs.

In the case of the Metropolitan City of Milan, the characterization by bands allocates the buildings with maximum minimum rents, respectively, in sub-zones 1 to 3, and only in some cases the maximum rent is applied to the buildings in the sub-zone 2.

In Milan, the best housing in relation to its characteristics is that located in sub-zone 3 and then to follow, in sub-zone 2 and sub-zone 1.

In the case of the Metropolitan City of Bari, the characterization by bands allocates the buildings with maximum minimum rents, in order, in sub-zones 3 to 1.

In Bari, the best housing in relation to its characteristics is that located in sub-zone 1 and then to follow, in sub-zone 2 and sub-zone 3.

For the purpose of the analysis, an instrumental score was calculated to measure minimum real estate features of the sub-zones, through the following formula (Equation (1)):

$$score_{min_{sub-zone}} = nC_A \cdot \%C_A + nC_B \cdot \%C_B + nC_C \cdot \%C_C \quad (1)$$

where nC_A, nC_B, and nC_C represent the number of characteristics defined in points (a), (b), and (c) for the three sub-zones and $\%C_A$, $\%C_B$, and $\%C_C$ represent, respectively, the percentages of the housing characteristics in relation to the total of those provided for in type A, B, and C, therefore: 1 < score < 5 in the sub-zona 1, 5 < score < 8 in the sub-zone 2, and score > 8 in the sub-zone 3. Finally, considering the minimum values of the scores, the following score 1 was selected for sub-zone 1, 5 for sub-zone 2, and 8 for sub-zone 3.

In the case of minimum rents, the characteristics of type D are not taken into account because they serve to identify only the maximum rents.

The variable accessibility has been assigned a score ranging from 1 to 5, based on the time to reach the centre of the municipality on foot, i.e., t < 15 min (score 5); 15 < t < 30 min (score 4), 31 < t < 60 min (score 3), 61 < t < 90 min (score 2) e > 90 min (score 1).

The database for the five variables considered and for the two metropolitan cities under study is summarized below (Tables 4 and 5).

Table 4. Database for the Metropolitan City of Milan (13/269 elements).

Municipality	Sub-Zone	Minimum Annual Rent	Minimum Real Estate Features	Accessibility	Pop. Density	€15,000 < pop. Income < €26,000
		€/sq.m	Score	Score	Inhab./sq.km	%
Arese	1	60.00	1	3	3000.46	26.54%
	2	68.00	5	3	3000.46	26.54%
	3	75.00	8	3	3000.46	26.54%
	1	54.00	1	3	3000.46	26.54%
	2	62.00	5	3	3000.46	26.54%
	3	68.00	8	3	3000.46	26.54%
Basiglio	1	90.00	1	2	3000.46	17.75%
	2	96.00	5	2	952.18	17.75%
	3	101.00	8	2	952.18	17.75%
	1	65.00	1	2	952.18	17.75%
	2	71.00	5	2	952.18	17.75%
	3	79.00	8	2	952.18	17.75%
Bollate	1	60.00	1	4	2801.91	34.89%

Table 5. Database for the Metropolitan City of Bari (12/45 elements).

Municipality	Sub-Zone	Minimum Annual Rent	Minimum Real Estate Features	Accessibility	Pop. Density	€15,000 < pop. Income < €26,000
		€/sq.m	Score	Score	Inhab./sq.km	%
Acqua viva Fonti	1	21.00	3	3	155.17	28.53%
	2	19.20	5	3	155.17	28.53%
	3	27.84	6	3	155.17	28.53%

Table 5. *Cont.*

Municipality	Sub-Zone	Minimum Annual Rent	Minimum Real Estate Features	Accessibility	Pop. Density	€15,000 < pop. Income < €26,000
		€/sq.m	Score	Score	Inhab./sq.km	%
Bari	1	21.00	3	5	2745.69	26.78%
	2	22.80	4	5	2745.69	26.78%
	3	40.92	4	5	2745.69	26.78%
	4	24.00	5	5	2745.69	26.78%
	5	20.76	5	5	2745.69	26.78%
	6	18.60	5	5	2745.69	26.78%
	7	21.00	5	5	2745.69	26.78%
	8	19.80	5	5	2745.69	26.78%
	9	24.60	6	5	2745.69	26.78%

In these tables, for reasons of space, we decided to highlight only the first 13 out of the 269 total elements for the Metropolitan City of Milan and the first 15 out of the 45 total elements for the Metropolitan City of Bari.

6.2. Coherence Analysis of the Agreed Rents Based on the k-Medoids Clustering

Among the literature-based centered algorithms, we chose k-medoids, which is a partitioning clustering algorithm related to the k-means algorithm, which is used differently from the latter, since it centers medoids instead of the average, or a point in the dataset closest to the average [51–54].

The k-medoids clustering analysis was implemented on the sample of the agreed rents signed in the metropolitan cities of Milan and Bari. The analysis was carried out on the two sets of the agreed rents structured according to the five characteristics previously introduced.

Given the heterogeneity of the units of measurement of the variables considered, they had to be standardized. In particular, they were transformed with the normalization *z-score* (Equation (2)):

$$z = \frac{x - \mu}{\sigma} \tag{2}$$

where x is the value of the variable to be standardized, μ is the mean of the given sample, and σ is the standard deviation of the given sample.

In particular, the NCSS software that implements a PAM, which uses the medoids as centers of k-means rather than media, was used for the processing of the two sets of the agreed rents, which is a dataset point closer to the average.

The validation of the classification produced was carried out on the basis of the values provided by Kaufman and Rousseeuw for the maximum average gauge in all values of k, namely SC.

Cluster analysis with k-medoids is instrumental in identifying different configurations of lease agreements that refer to different levels of implementation of SH policies.

6.2.1. Results for the Metropolitan City of Milan

The analysis based on the k-medoids clustering aims to identify a dissimilarity of the agreed rents in the Metropolitan City of Milan and their distance within the single cluster.

The analysis of the first the dataset of agreed rents for the Metropolitan City of Milan highlighted the following partition into three clusters:

- (agreed rents 1–72; 74–75; 77–269) ∈ Cluster 1 with centroid in agreed rent 14;
- (agreed rent 73) ∈ Cluster 2 with centroid in agreed rent 73;
- (agreed rent 76) ∈ Cluster 3 with centroid in agreed rent 76.

The value of SC for the Cluster 1 is 0.88, which, according to the values proposed for it by Kaufman and Rousseeuw [38], identifies a strong structure.

The other clusters, i.e., Clusters 2 and 3, have a SC of 0 so in both cases no substantial structure was found.

In this case too, the analysis with k-medoids identifies three different configurations of reference agreed rents that refer to different levels of promotion of SH policies.

The three centroids (Figure 11) represent the center to which to report all the agreed rent falling within the specific cluster. These centroids are characterized by the following values of the characteristics, for which, to foster greater understanding, we present their not-normalized values:

- Centroid 1: annual rent of €70 per square meter; minimum real estate features score 5; accessibility score 4; population density 2801.91; population with income 15,000–26,000 as 35%, municipality: Bollate; sub-zone 2;
- Centroid 2: annual rent of €44 per square meter; minimum real estate features score 1; accessibility score 3; population density 3412.67; population with income 15,000–26,000 as 32%. municipality: Legnano-semi-central; sub-zone 1.
- Centroid 3: annual rent of €35 per square meter; minimum real estate features score 1; accessibility score 3; population density 3412.67; population with income 15,000–26,000 as 32%. Municipality: Legnano-suburb; sub-zone 1.

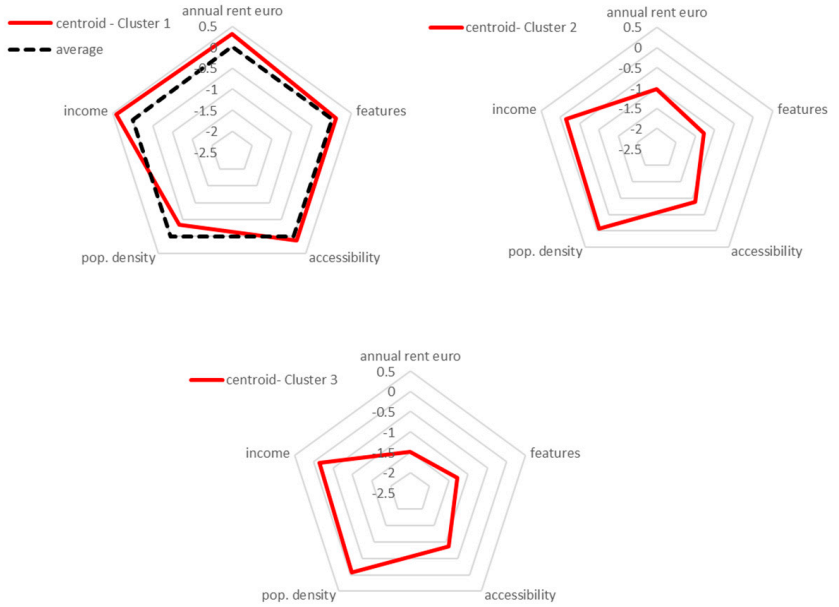


Figure 11. The three centroid clusters of the agreed rent dataset for the Metropolitan City of Milan identified based on k-medoids clustering analysis.

The number of clusters and number of classified elements in them highlights the existence of sub-market in the sample of agreed rents.

Only Cluster 1 can be considered a sub-market, as can be seen from the analysis on the robustness of the results of the cluster analysis. Clusters 2 and 3 do not identify a significant structure. The segment identified by cluster 1 is characterized by 267 agreed rents, while Cluster 2 and Cluster 3 are each characterized by one agreed rent.

The cluster analysis of the agreed rents within the Metropolitan City of Milan has highlighted only one segment, that of Cluster 1, in which the policies of social housing have been implemented consistently.

As a result, Cluster 1 appears to be the most significant to detect the coherence of the agreed rents for the Metropolitan City of Milan.

A further analysis by sub-zones of Cluster 1 highlighted the cluster's internal differentiation based on the distance from the centroid, which is represented by the dimension of

the sphere: the shorter the distance, the smaller the sphere, and the smaller the sphere, the bigger the coherence.

In particular, in Figure 12, the dimension of the sphere represents the distance, that is the dissimilarity of the agreed rent considered with the centroid agreed rent of reference for Cluster 1, that is with Bollate-centre-sub-zone 2 and for sub-zone 1.

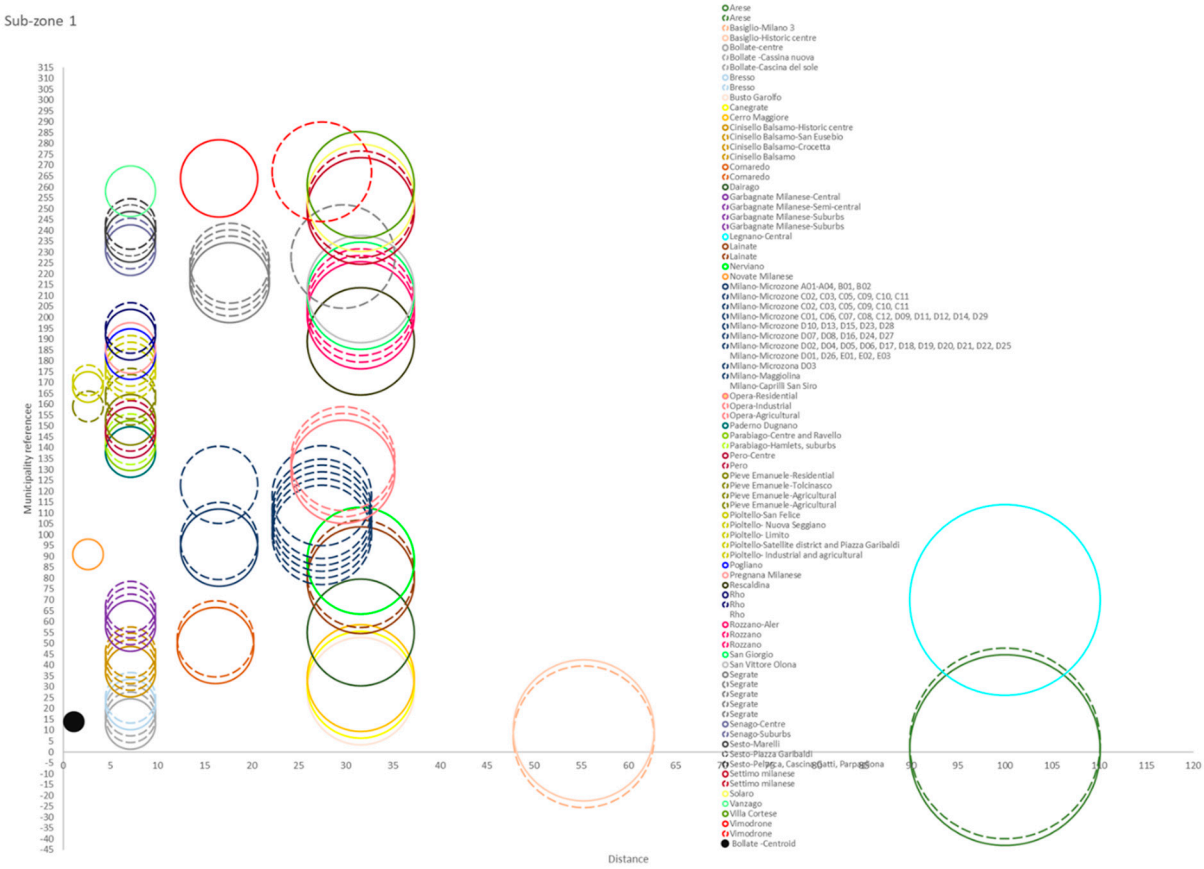


Figure 12. The internal differentiation of Cluster 1 elements based on distance from its centroid (sub-zones 1).

In Figure 13, the dimension of the sphere represents the distance, that is the dissimilarity of the agreed rent considered with the centroid or agreed rent of reference for Cluster 1, that is with Bollate-center-sub-zone 2 and for sub-zone 2.

In Figure 14, the dimension of the sphere represents the distance, that is the dissimilarity of the agreed rent considered with the centroid or agreed rent of reference for Cluster 1, that is with Bollate-centre-sub-zone 2 and for sub-zone 3.

The analysis based on the clustering k-medoids, which aims to identify a similarity within a single cluster, has evidenced results that are quite articulated. In this regard, in order to propose a more structured discussion of the results we have achieved, we propose to follow a further analysis aimed at highlighting the internal differentiation of the cluster by a filtering based on the semantic of differentiation of the attractiveness of MACBETH applied to the clusters 1 for the Metropolitan City of Milan.

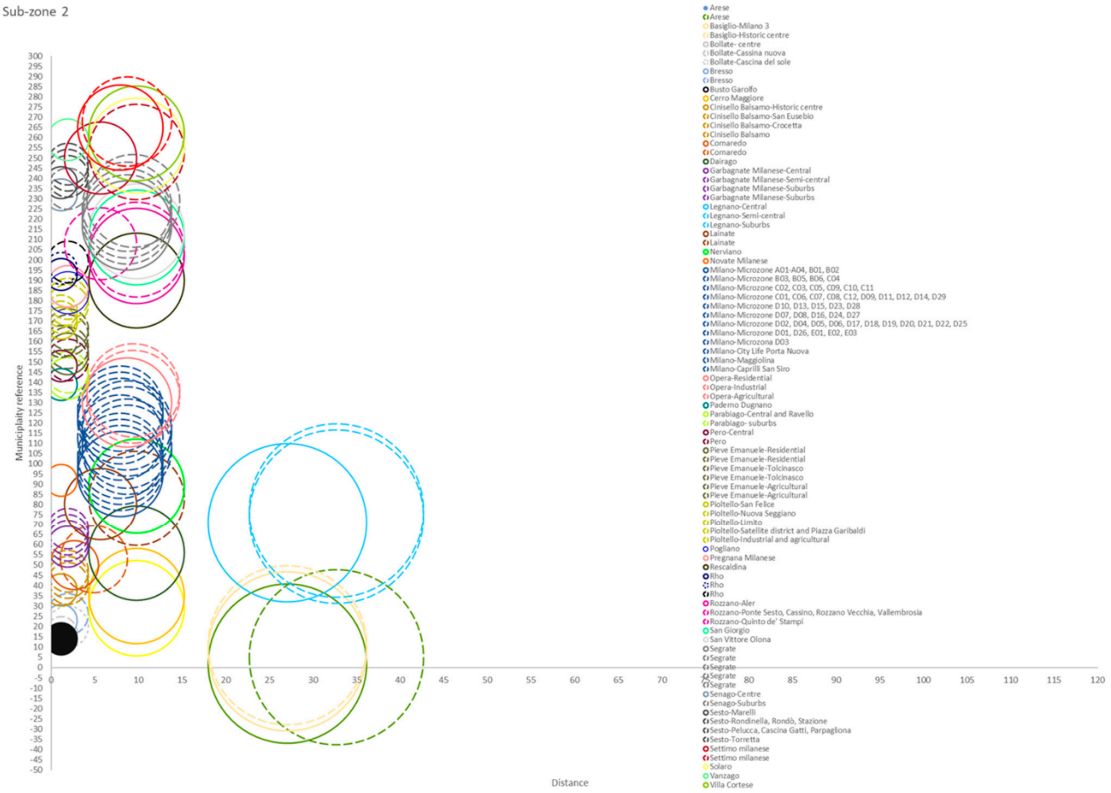


Figure 13. The internal differentiation of Cluster 1 elements based on distance from its centroid (sub-zones 2).

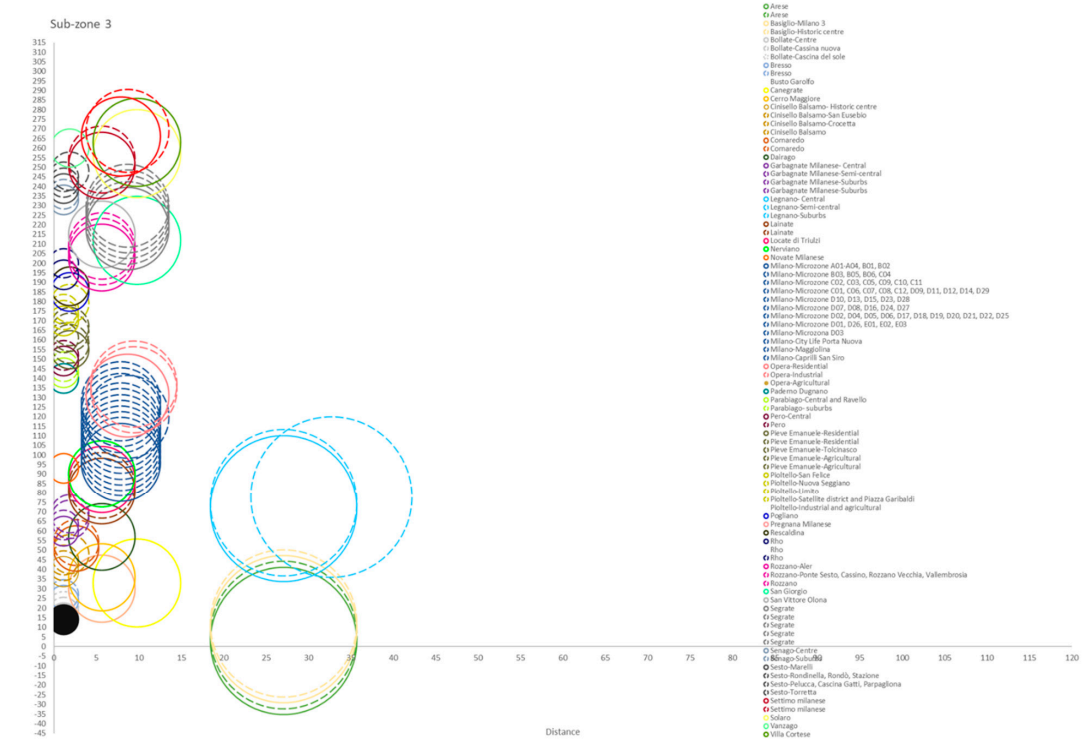


Figure 14. The internal differentiation of Cluster 1 elements based on distance from its centroid (sub-zones 3).

The semantic categories of MACBETH and the corresponding distances from the centroid are: *extreme* (>100), *very strong* (100–40), *strong* (40–20), *moderate* (20–10), *weak* (10–3), *very weak* (3–1), *no difference* (1–0).

We chose to attribute to the agreed rent falling in the semantic categories no difference, very weak, and weak, respectively, excellent coherence, very good, and a good coherence.

The analysis by sub-zones of Cluster 1 for the Metropolitan City of Milan highlighted the following cluster internal differentiations.

Figure 15 shows the location of the sub-zones 1 in the Metropolitan City of Milan in which the groupings of the agreed rents are identified with a very strong, strong, moderate, weak, and very weak distance to Cluster centroid 1 (see also Appendix A).

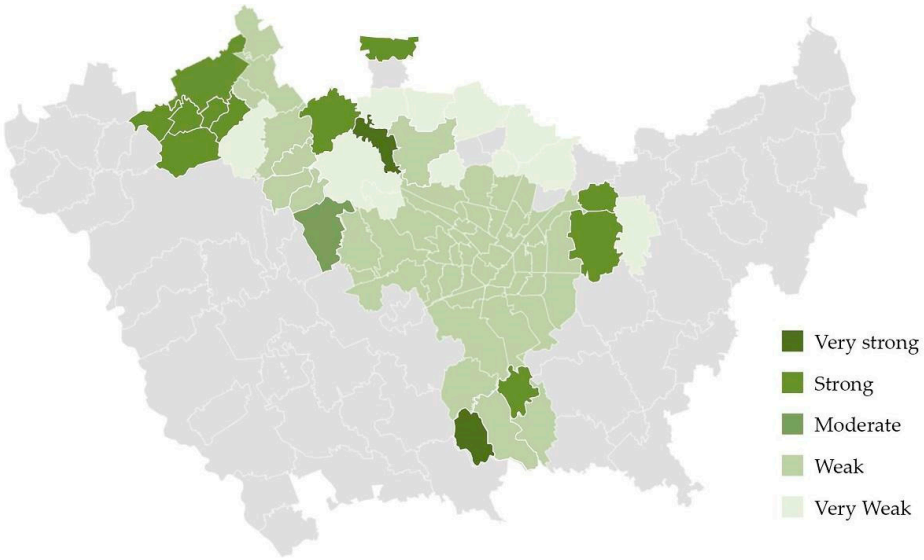


Figure 15. Location of the sub-zones 1 in the Metropolitan City of Milan according to the internal differentiation of Cluster 1 elements based on distance from its centroid.

Figure 16 shows the location of the sub-zones 2 in the Metropolitan City of Milan in which the groupings of the agreed rents are identified with a strong or weak distance to Cluster centroid 1 (see also Appendix B).

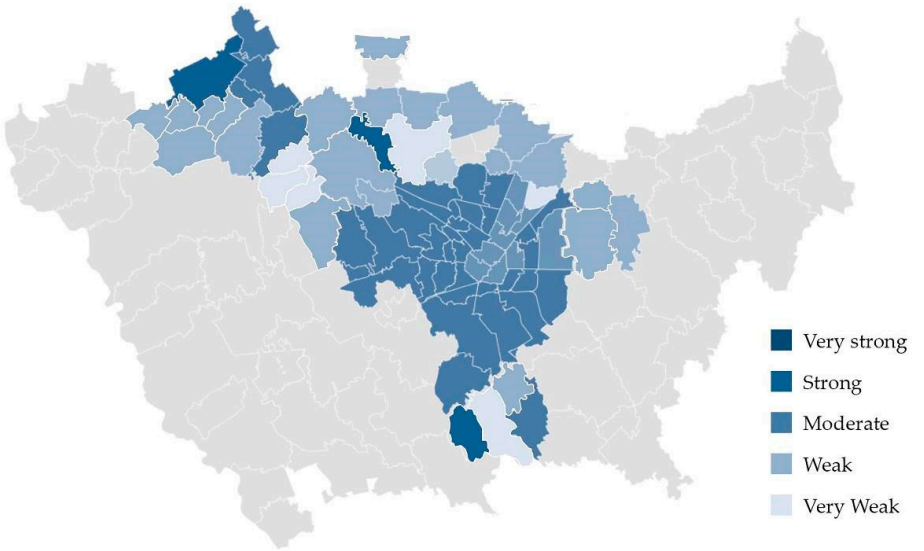


Figure 16. Location of the sub-zones 2 in the Metropolitan City of Milan according to the internal differentiation of Cluster 1 elements based on distance from its centroid.

Figure 17 shows the location of the sub-zones 3 in the Metropolitan City of Milan in which the groupings of the agreed rents are identified with a strong, weak, and very weak distance to Cluster centroid 1 (see also Appendix C).

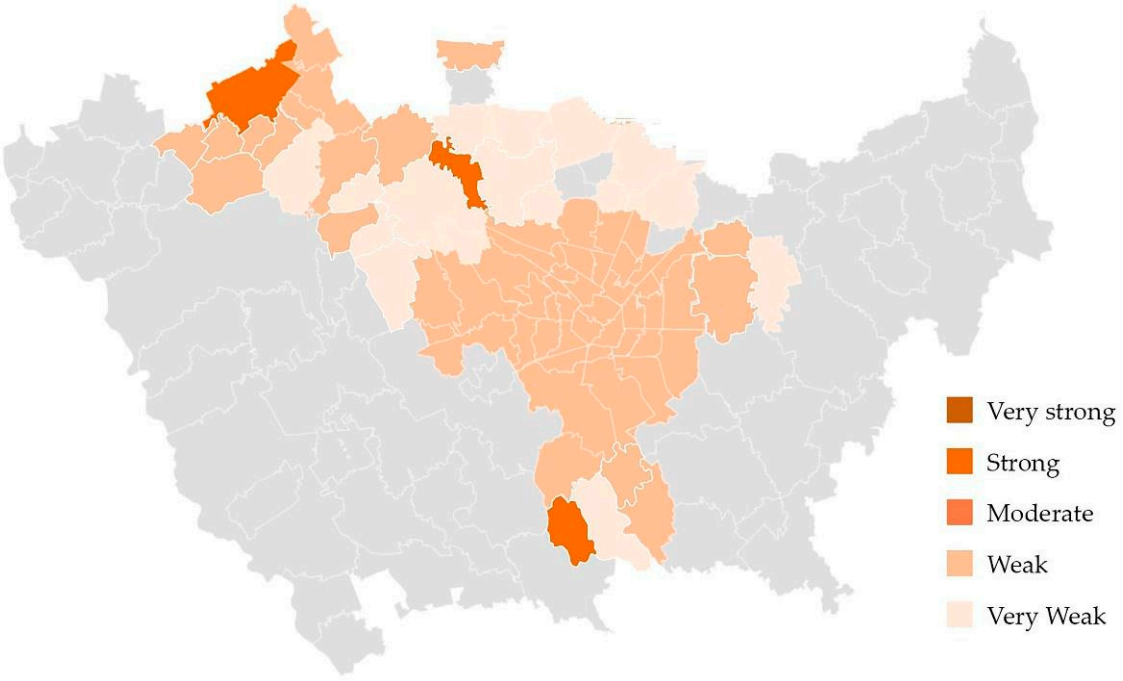


Figure 17. Location of the sub-zones 3 in the Metropolitan City of Milan according to the internal differentiation of Cluster 1 elements based on distance from its centroid.

6.2.2. Results for the Metropolitan City of Bari

The analysis based on the k-medoids clustering of the second data set of agreed rents for the Metropolitan City of Bari highlighted the following partition into three clusters:

- (agreed rent 4) $\in$ Cluster 1 with centroid in agreed rent 4;
- (agreed rents 1–3, 5–35, 37–45) $\in$ Cluster 2 with centroid in agreed rent 16;
- (agreed rent 36) $\in$ Cluster 3 with centroid in agreed rent 3.

The value of SC for the Cluster 2 is 0.84, which, according to the values proposed for it by Kaufman and Rousseeuw, identifies a strong structure. The other clusters, i.e., Clusters 1 and 3, have a SC of 0 so in both cases, no substantial structure was found.

The three clusters structure is characterized by the three centroids that represent the center to which to report all agreed rents falling within the specific cluster. The three centroids (Figure 18) have the following values of the characteristics, which, in order to favor their understanding, are reported as the not-normalized values:

- Centroid 1: annual rent of €26.04 per square meter; minimum real estate features score 5; accessibility score 4; population density 312.65; population with income 15,000–26,000 as 26%, municipality: Adelfia; sub-zone 1.
- Centroid 2: annual rent of €22.32 per square meter; minimum real estate features score 4; accessibility score 3; population density 498.96; population with income 15,000–26,000 as 25%, municipality: Bitonto; sub-zone 3.
- Centroid 3: annual rent of €14.28 per square meter; minimum real estate features score 3; accessibility score 3; population density 643.44; population with income 15,000–26,000 as 23%, municipality: Noicottaro; sub-zone 1.

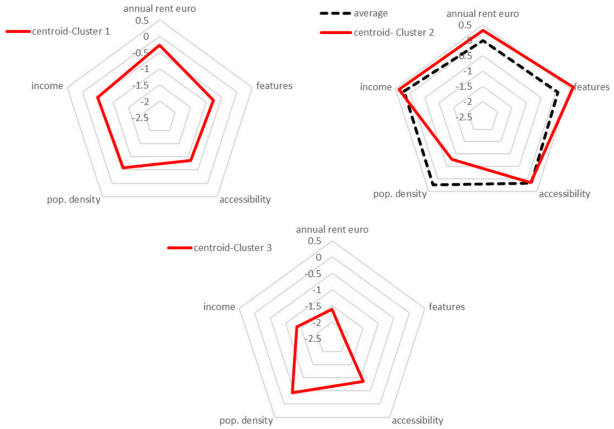


Figure 18. The three clusters of the rent dataset for the Metropolitan City of Bari identified based on k-medoids clustering analysis.

In the case of the Metropolitan City of Bari, only Cluster 2 can be considered a sub-market, as can be seen from the analysis on the robustness of the results of the cluster analysis. Clusters 1 and 3 do not identify a significant structure. The segment identified by Cluster 2 is characterized by 43 agreed rents, while Cluster 1 and Cluster 3 are characterized by one agreed rent.

The cluster analysis of the agreed rents within the Metropolitan cIty of Bari highlighted the segment of Cluster 2, in which the policies of social housing were implemented in a coherent manner.

As a result, Cluster 2 appears to be the most significant to detect the coherence of the agreed rents for the Metropolitan City of Bari.

In particular, in Figure 19a, the dimension of the sphere represents the distance of the agreed rent considered with the centroid or agreed rent of reference for Cluster 2, that is the agreed rent for Bitonto-sub-zone 3 and those of the sub-zone 1.

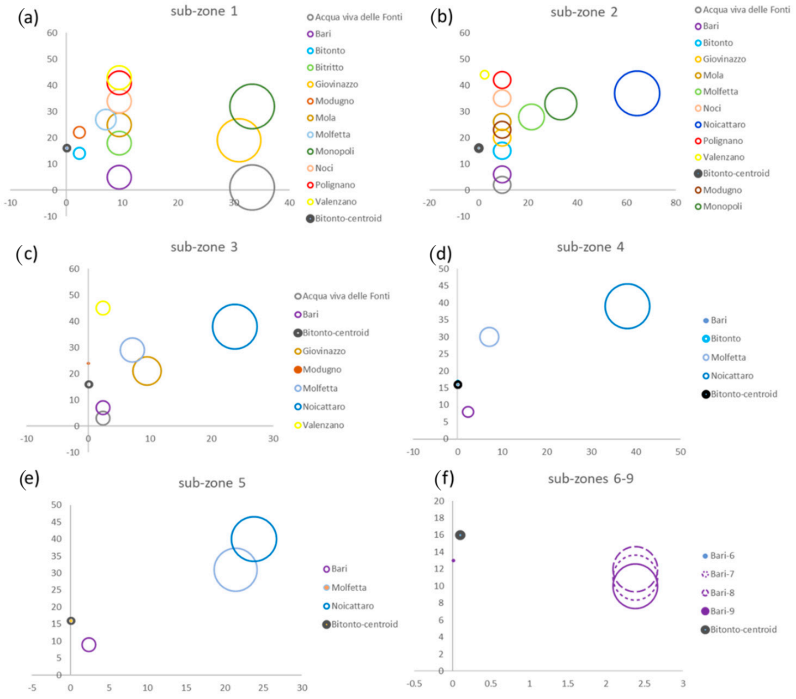


Figure 19. The internal similarity of Cluster 2 elements based on distance from its centroid: (**a**) in the sub-zone 1; (**b**) in the sub-zone 2; (**c**) in the sub-zone 3; (**d**) in the sub-zone 4; (**e**) in the sub-zone area 5; (**f**) in the sub-zones 6–9.

In Figure 19b, the dimension of the sphere represents the distance of each agreed rent for the sub-zone 2 with the centroid of Cluster 2, namely Bitonto-sub-zone 3.

Similarly, in Figure 19c–f, the dimension of the sphere represents the distance, that is the dissimilarity of the agreed rent considered with the centroid or agreed rent of reference for Cluster 2, that is Bitonto-sub-zone 3 respectively with sub-zone 3, sub-zone 4, sub-zone 5, and sub-zones 6-7-8-9.

These last types of sub-zones were detected only for the municipality of Bari.

In addition, in the case of the Metropolitan City of Bari, we propose a further analysis aimed at highlighting the internal similarity of the Cluster 2 by a filtering based on the semantic categories of Macbeth.

The analysis by sub-zones of Cluster 2 for the Metropolitan City of Bari highlighted the following cluster internal differentiations.

For the agreed rents in sub-zone 1 of the Metropolitan City of Bari, the following groupings are identified, characterized by a strong (Acqua viva delle Fonti, Giovinazzo and Monopoli), moderate (Bari, Bitritto, Mola, Noci, Polignano and Valenzano), weak (Molfetta), and very weak (Bitonto sub-zone 1 and Modugno) distance to Cluster centroid 2.

For the agreed rents in sub-zone 2 of the Metropolitan City of Bari, the following groupings are identified, characterized by a very strong (Noicottaro), strong (Molfetta and Monopoli), moderate (Acqua viva delle Fonti, Bari, Bitonto sub-zone 2, Giovinazzo, Modugno, Mola, Noci, Polignano), and very weak (Valenzano) distance to Cluster centroid 2.

For the agreed rent in sub-zone 3 of the Metropolitan City of Bari, the following groupings are identified, characterized by a strong (Noicottaro), moderate (Giovinazzo), weak (Molfetta), very weak (Acqua viva delle Fonti, Bari, and Valenzano), and no difference (Modugno) centroid distance of cluster 2.

For the agreed rents in sub-zone 4 of the Metropolitan City of Bari, the following groupings are identified, characterized by a strong (Noicottaro), weak (Molfetta), very weak (Bari), and no difference (Bitonto-sub-zone 4) centroid distance of Cluster 2.

For the agreed rents in sub-zone 5 of the Metropolitan City of Bari, the following groupings are identified, characterized by a strong (Molfetta and Noicottato), very weak (Bari) centroid distance of Cluster 2.

For these agreed rents, the following groupings are identified: very weak (Bari subzone 6, 7, 8) and no difference (Bari sub-zone 9) centroid distance of cluster 2.

6.3. External Coherence of the Agreed Rents

To explore the external consistency of the agreed rents, they were compared to the OMI rents. In the OMI database, the rents of so-called "Abitazioni civili" properties, which are housing units with average characteristics, were selected for each OMI zone that corresponds to the zones in all the municipalities of the case study. Subsequently, the percentage variation between the two rents was calculated, for both the minimum and maximum values. If the variation is negative, it means that the agreed rent is lower than the market rent and, therefore, is more affordable. If the variation is positive, it means the opposite.

Figure 20 shows the variation for all the agreed rents in the Milan Metropolitan City dataset that have a weak or very weak distance from the centroid, that is, for those rents that had strong internal cluster coherence. The results show that, on average, only one third of the agreed rents are lower than the OMI rents and therefore more affordable. The percentage is lowest for the lowest values in the very weak category (24.39%) (Figure 20a) and highest for the highest values in the weak category (Figure 20b).

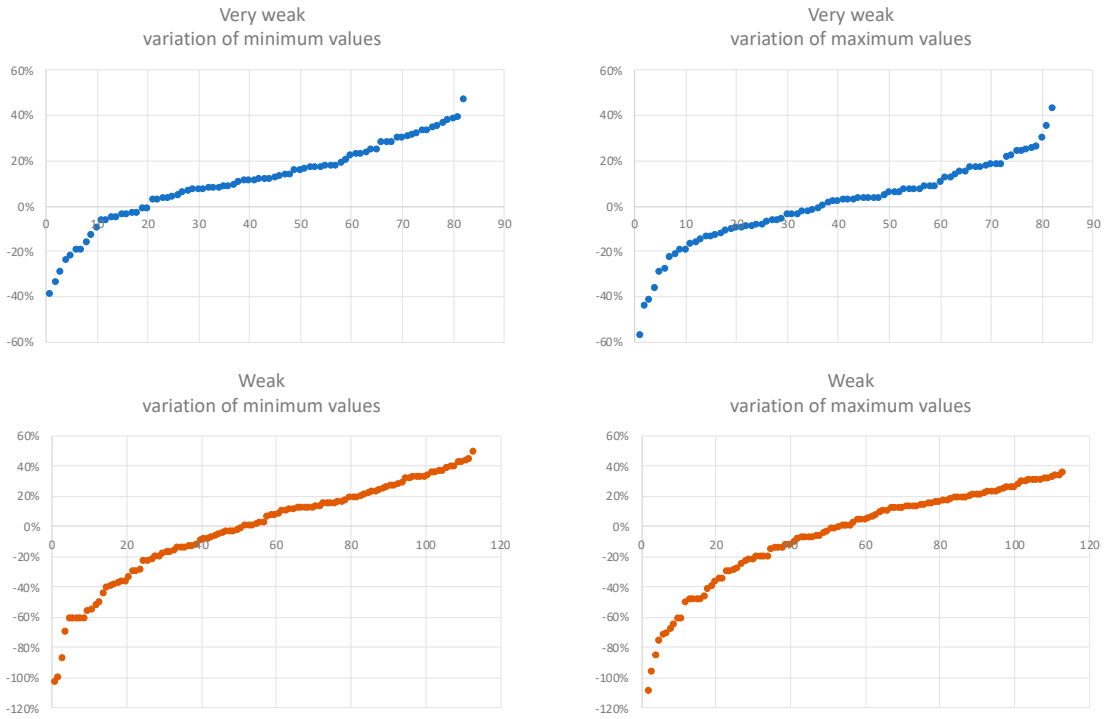


Figure 20. Variation of the minimum (**a**) and maximum (**b**) agreed rent over the OMI's rents in the Metropolitan City of Milan.

Figure 21 shows that, on the other hand, the agreed rents in the Bari Metropolitan City dataset are always below the OMI rents, with the exception of one data point (Figure 21b), and always more affordable than market rents.

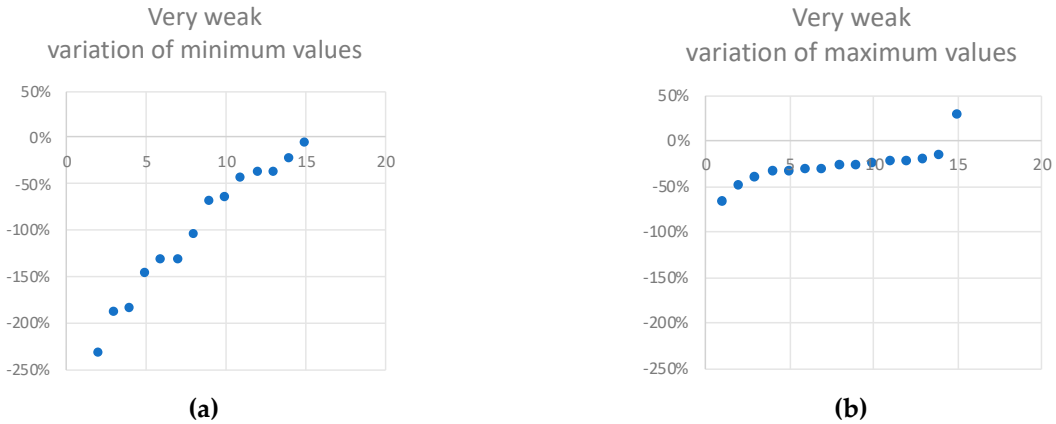


Figure 21. Variation of the minimum (**a**) and maximum (**b**) agreed rent over the OMI's rents in the Metropolitan City of Bari.

7. Discussion

The analysis based on the k-medoids clustering aims at identifying a dissimilarity of the agreed rents in the two metropolitan cities of Milan and Bari has highlighted in both cases two outliers, namely Cluster 2 and 3 in the case of Milan, and Cluster 1 and 3 in the case of Bari. The agreed rents cluster analysis can be used to verify the coherence of the social housing policies implemented in the two metropolitan areas under study.

7.1. Coherence of the Agreed Rents in Two Metropolitan Cities Based on the Semantic Categories of MACBETH

The results of the analysis aimed at highlighting the internal similarity of the cluster by a filtering based on the semantic categories of MACBETH applied to Clusters 1 and 2, respectively, for the metropolitan cities of Milan and Bari can be aggregated to identify the percentages of the agreed rents that fall in areas characterized by good internal coherence and those with low coherence.

7.1.1. Coherence of the Agreed Rents in the Metropolitan City of Milan

The frequency analyses of the agreed rents for the different semantic categories of MACBETH and for the different sub-zones provide information on the degree of coherence within the cluster of such agreed rents.

In the Metropolitan City of Milan, this analysis highlighted the following degrees of coherence within the cluster of agreed rents and the different sub-zones (Figure 22).

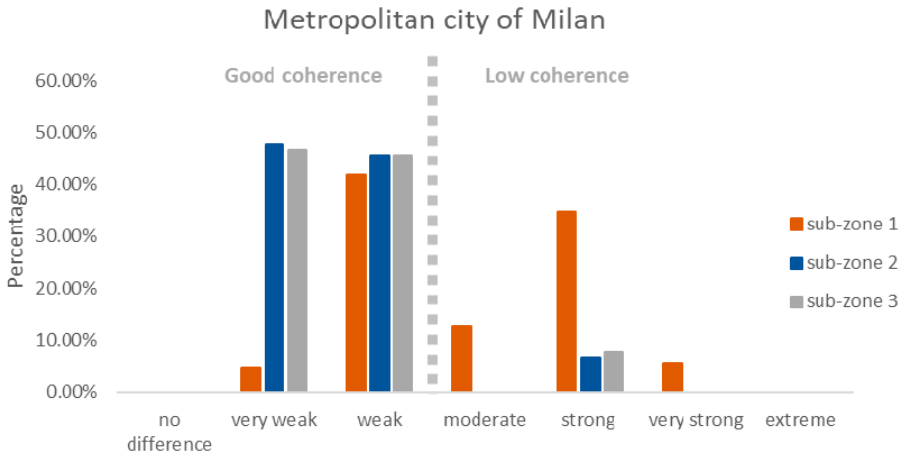


Figure 22. Percentage of the agreed rents for the different sub-zones based on the semantic categories of MACBETH.

Sub-zone 1 has a percentage of agreed rents of 5% in the very weak category, 42% in the weak category, 13% in the moderate category, 35% in the strong category, and 5% in the very strong category, so only 47% have a good and very good coherence.

Sub-zone 2 has a percentage of agreed rents of 48% in the very weak category, 45% in the weak category, 7% in the strong category, 5% in the very strong category, so 93% have good and very good coherence.

Sub-zone 3 has a percentage of agreed rents as 47% in the very weak category, 45% in the weak category, 7% in the strong category, 8% in the very strong category, so 92% have good and very good coherence.

These analyses show that the overall coherence of the agreed rents for the Metropolitan City of Milan have good and very good coherence in sub-zones 2 and 3, and less coherence in sub-zone 1.

If, on the one hand, the observed coherence of agreed rents shows equity in the implementation of SH policies at least for sub-zones 3,4 and 6–9, on the other hand there is no remodeling of the agreed rents based on sub-zones.

7.1.2. Coherence of the Agreed Rents in the Metropolitan City of Bari

The frequency analyses of the agreed rents for the different semantic categories of MACBETH and for the different sub-zones provide information on the degree of coherence within the cluster of such agreed rents (Figure 23).

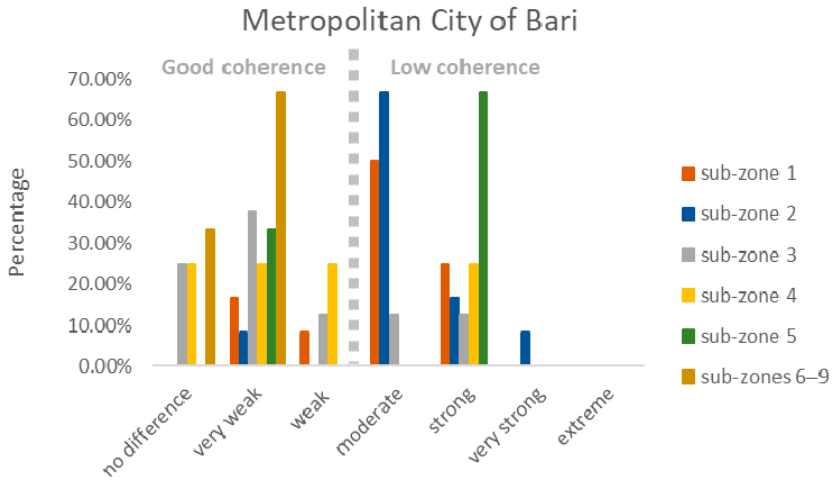


Figure 23. Percentage of the agreed rents for the different sub-zones based on the semantic categories of MACBETH.

The semantic category that most characterizes sub-zones 1 and 2 is the moderate one, with a percentage of 50% in the first case and 67% in the second case of the agreed rents falling within this class; this implies a lack of coherence of such reference agreed rents to the centroid.

Sub-zone 3 has a percentage of agreed rents of 25% in the no difference category, therefore coinciding with the centroid, highlighting an excellent coherence, and has a percentage of agreed rents of 38% in the very weak category and therefore very consistent with it.

Sub-zone 4 has the same percentage of agreed rents of 25% in the category no difference, very weak, and weak, therefore with excellent, very good, and good overall coherence with the centroid, only 25% of them belong to the strong category.

The 33% of agreed rents in sub-zone 5 belong to the very weak category, thus with very good coherence, while 67% belong to the strong category, thus with a greater distance from the centroid.

Sub-zones 6–9, that concern only the municipality of Bari, have 33% of the agreed rent coinciding with the centroid and 67% belonging to the very weak category, so overall they have a very good coherence to the centroid.

These analyses show that the overall coherence of the agreed rents for the Metropolitan City of Bari have good and very good coherence for sub-zones 3, 4, and 6–9, and have low coherence for sub-zones 1, 2, and 5.

If, on the one hand, the observed coherence of agreed rents shows equity in the implementation of SH policies at least for sub-zones 3, 4, and 6–9, on the other hand there is no remodeling of the agreed rents based on sub-zones.

7.2. Comparison of the Coherence of the Agreed Rents in the Two Metropolitan Cities

The k-medoids clustering analysis implemented on the sample of the agreed rents signed in the two metropolitan cities analyzed has in both cases identified only one significant grouping of Cluster 2 for the Metropolitan City of Bari and Cluster 1 for the Metropolitan City of Milan.

The analysis showed that the agreed rents for the two metropolitan cities have good coherence for sub-zone 3, which in both cases are not equivalent, as in the case of Milan they identify the best zones and in the case of Bari the worst, showing a lack of coherence of the agreed rents between the two zones (Figure 24).

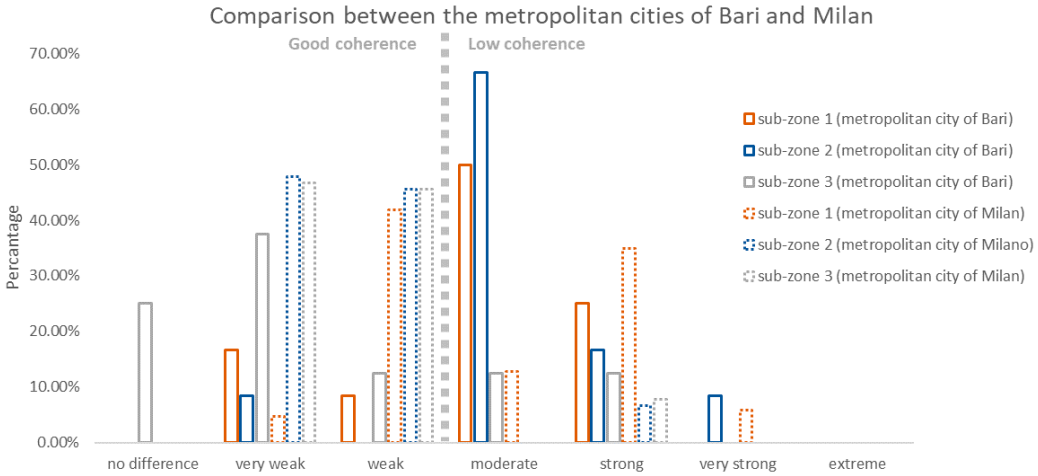


Figure 24. Comparison between the percentage of the agreed rents for the different sub-zones of the two metropolitan cities of Bari and Milan.

A comparison of the two clusters representative for the two metropolitan cities based on the cumulative frequency up to the weak category shows different percentages for sub-zone 2 of Milan and Bari, in the first case 92% and in the second case 25%, despite being the corresponding zones for the reasons mentioned.

With the values recorded for the five characteristics considered, the comparison of the Cluster 2 centroids for the Metropolitan City of Bari and the Cluster 1 for the Metropolitan City of Milan shows a total coherence for the rent value and percentage of the population with an income between €15,000 and €26,000, as well as for the territorial accessibility and population density, and also for the real estate characteristics provided for the reference agreed rent (Figure 25).

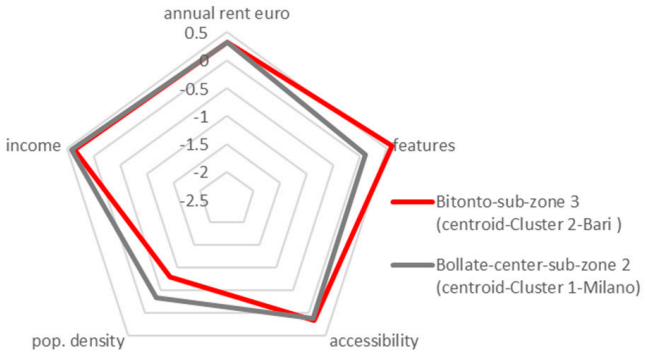


Figure 25. Comparison between the two centroids of the most representative clusters for the metropolitan cities of Bari and Milan.

8. Conclusions

To make SH rents fair, affordable, and below market rents, governments must set certain legal thresholds by choosing benchmark rents, which should be easy to apply as well as flexible and updatable to represent segments of the housing market in different areas of the same city or between different cities in the same territory. In the case of Italian law, the benchmark rents are based on local territorial agreements between landlords and tenant associations. Therefore, these agreed rents have the advantage of being renewed every year and diversified by city and area, although they are not mandatory and do not exist for all Italian municipalities.

The analysis of the agreed rents through cluster analysis showed that although there is good internal consistency between the groups of rents, there are numerous areas or municipalities where the dissimilarities are strong or very strong. Thus, the use of the

agreed rents as benchmark rents for SH causes inefficiencies and spatial inequalities. The comparison between agreed and OMI rents showed that the results are diversified, but more importantly, that many agreed rents are higher than OMI rents and, consequently, than market rents.

This study was already applied to two large metropolitan cities, but the research could be extended to other Italian cities and territories and learn about the spatial consequences of legal regulations. The further results obtained can also be processed to develop a national mapping of fair and affordable rent gradients.

However, the results so far show that the rule by law therefore has limited effectiveness and would need to be complemented by monitoring tools, such as cluster analysis, to know which cases need corrective measures to be taken to make rents fair and affordable for low-income households.

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Appendix A

Table A1. Groupings of locations in the sub-zones 1 of the Metropolitan City of Milan with respect to the centroid of Cluster 1.

Typology of Distance	Municipalities in the Metropolitan City of Milan
Very strong	Arese 1–2; Basiglio-Milano 3; Basiglio-Historic centre; Legnano-Central
Strong	Busto Garolfo; Canegrate; Cerro Maggiore; Dairago; Lainate 1–2; Locate di Triulzi; Nerviano; Milano-Microzone: C02, C03, C05, C09, C10, C11; Milano-Microzone: C01, C06, C07, C08, C12, D09, D11, D12, D14, D29; Milano-Microzone:D10, D13, D15, D23, D28; Milano-Microzone: D07, D08, D16, D24, D27; Milano-Microzone: D02, D04, D05, D06, D17, D18, D19, D20, D21, D22, D25; Milano-Microzone: D01, D26, E01, E02, E03; Milano-Microzona:D03; Opera-Residential; Opera-Industrial; Opera-Agricultural; Rescaldina; Rozzano-Aler; Rozzano 1–2; San Giorgio; San Vittore Olona, Segrate; Settimo milanese 1–2; Solaro; Villa Cortese; Vimodrone
Moderate	Cornaredo 1–2; Milano-Microzone: A01-A04, B01, B02; Milano-Microzone: B03, B05, B06, C04; Milano-Maggiolina; Milano-Caprilli San Siro; Segrate 1–4; Vimodrone
Weak	Bollate-centre; Bollate-Cassina nuova; Bollate-Cascina del sole; Bresso 1–2; Cinisello Balsamo-Historic centre; Cinisello Balsamo-San Eusebi; Cinisello Balsamo-Crocetta; Cinisello Balsamo; Garbagnate Milanese-Central; Garbagnate Milanese-Semi-central; Garbagnate Milanese-Suburbs; Garbagnate Milanese-Suburbs; Paderno Dugnano; Parabiago-Centre and Ravello; Parabiago-Hamlets, suburbs; Pero-Centre; Pero; Pieve Emanuele-Residential, Pieve Emanuele-Residential; Pieve Emanuele-Agricultural; Pieve Emanuele-Agricultural; Pioltello- Limito, Pioltello-Satellite district and Piazza Garibaldi; Pioltello- Industrial and agricultural; Pogliano; Pregnana Milanese; Rho 1–3; Senago-Centre; Senago-Suburbs; Sesto-Marelli; Sesto-Piazza Garibaldi; Sesto-Pelucca; Cascina Gatti; Parpagliona; Vanzago
Very weak	Novate Milanese; Pieve Emanuele-Tolcinasco; Pioltello-San Felice; Pioltello-Nuova Seggiano

Appendix B

Table A2. Groupings of locations in the sub-zones 2 of the Metropolitan City of Milan with respect to the centroid of Cluster 1.

Typology of Distance	Municipalities in the Metropolitan City of Milan
Very strong	Arese 1–2; Basiglio-Milano 3; Legnano-Central; Legnano-Semi-central; Legnano-Suburbs
Strong	
Moderate	
Weak	Busto Garolfo; Canegrate; Cerro Maggiore; Cornaredo; Dairago; Lainate 1–2, Locate di Triulzi; Nerviano; Milano-Microzone: A01-A04, B01, B02; Milano-Microzone: B03, B05, B06, C04; Milano-Microzone: C02, C03, C05, C09, C10, C11; Milano-Microzone: C01, C06, C07, C08, C12, D09, D11, D12, D14, D29; Milano-Microzone: D10, D13, D15, D23, D28; Milano-Microzone: D07, D08, D16, D24, D27, Milano-Microzone: D02, D04, D05, D06, D17, D18, D19, D20, D21, D22, D25; Milano-Microzone: D01, D26, E01, E02, E03; Milano-Microzona: D03; Milano-City Life Porta Nuova; Milano-Maggiolina; Milano-Caprilli San Siro; Opera-Residential; Opera-Industrial; Opera-Agricultural; Rescaldina; Rozzano-Aler; Rozzano-Ponte Sesto; Cassino; Rozzano historic centre; Vallembrosia; Rozzano-Quinto de' Stampi; San Giorgio; San Vittore Olona; Segrate 1–5; Settimo milanese 1–2; Solaro; Villa Cortese; Vimodrone 1–2
Very weak	Basiglio-historic centre; Bollate-centre; Bollate-Cassina nuova; Bollate-Cascina del sole; Bresso 1–2; Cinisello Balsamo-historic centre; Cinisello Balsamo-San Eusebio; Cinisello Balsamo-Crocetta; Cinisello Balsamo; Cornaredo; Garbagnate Milanese-Central; Garbagnate Milanese-Semi-centra; Garbagnate Milanese-Suburbs 1–2; Novate Milanese; Paderno Dugnano; Parabiago-Central and Ravello; Parabiago-suburbs; Pero-Central; Pero; Pieve Emanuele-Residential 1–2; Pieve Emanuele-Tolcinasco; Pieve Emanuele-Agricultural 1–2; Pioltello-San Felice; Pioltello-Nuova Seggiano; Pioltello-Limito; Pioltello-Satellite district and Piazza Garibaldi; Pioltello-Industrial and agricultural; Pogliano; Pregnana Milanese; Rho 1–3; Senago-Centre; Senago-Suburbs; Sesto-Marelli; Sesto-Rondinella, Rondò, Station; Sesto-Pelucca, Cascina, Gatti, Parpagliona, Sesto-Torretta; Vanzago

Appendix C

Table A3. Groupings of locations in the sub-zones 3 of the Metropolitan City of Milan with respect to the centroid of Cluster 1.

Typology of Distance	Municipalities in the Metropolitan City of Milan
Very strong	
Strong	Arese 1–2; Basiglio-Milano 3; Basiglio-Historic centre; Legnano-Central; Legnano-Semi-central; Legnano-Suburbs
Moderate	
Weak	Busto Garolfo; Canegrate; Cerro Maggiore; Dairago; Lainate 1–2; Locate di Triulzi; Nerviano; Milano-Microzone: A01-A04, B01, B02; Milano-Microzone: B03, B05, B06, C04; Milano-Microzone: C02, C03, C05, C09, C10, C11; Milano-Microzone: C01, C06, C07, C08, C12, D09, D11, D12, D14, D29; Milano-Microzone: D10, D13, D15, D23, D28;, Milano-Microzone: D07, D08, D16, D24, D27; Milano-Microzone: D02, D04, D05, D06, D17, D18, D19, D20, D21, D22, D25; Milano-Microzone: D01, D26, E01, E02, E03; Milano-Microzona: D03; Milano-City Life Porta Nuova; Milano-Maggiolina; Milano-Caprilli San Siro; Opera-Residential; Opera-Industrial; Opera-Agricultural; Rescaldina; Rozzano-Aler; Rozzano-Ponte Sesto, Cassino; Rozzano-Vecchia, Vallembrosia, Rozzano; San Giorgio; San Vittore Olona; Segrate 1–5; Settimo milanese 1–2; Solaro, Vanzago; Villa Cortese; Vimodrone 1–2
Very weak	Bollate-Centre; Bollate-Cassina nuova; Bollate-Cascina del sole; Bresso 1–2; Cinisello Balsamo- historic centre; Cinisello Balsamo-San Eusebio; Cinisello Balsamo-Crocetta; Cinisello Balsamo; Cornaredo 1–2; Garbagnate Milanese-Central; Garbagnate Milanese-Semi-central; Garbagnate Milanese-Suburbs; Garbagnate Milanese-Suburbs; Novate Milanese; Paderno Dugnano; Parabiago-Central and Ravello; Parabiago- suburbs; Pero-Central; Pero; Pieve Emanuele-Residential; Pieve Emanuele-Residential; Pieve Emanuele-Tolcinasco; Pieve Emanuele-Agricultural 1–2; Pioltello-San Felice; Pioltello-Nuova Seggiano; Pioltello-Limito; Pioltello-Satellite district and Piazza Garibaldi; Pioltello-Industrial and agricultural, Pogliano; Pregnana Milanese; Rho 1–3; Senago-Centre, Senago-Suburbs; Sesto-Marelli; Sesto-Rondinella, Rondò, Station; Sesto-Pelucca, Cascina Gatti, Parpagliona; Sesto-Torretta

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sustainability

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Article

Infrastructures and Sustainability: An Estimation Model for a New Highway Near Genoa

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Abstract: The economic development of a territory is strongly correlated to its level of infrastructure (railway, roads, etc.); the complexity of this type of works requires careful planning and design that cannot be separated from the assessment of the impacts generated on citizenship affected by the new infrastructures. This study deals with the instrument defined by the Liguria Region for the implementation of infrastructures through the instruments called "Programmi Regionali di Intervento Strategico—P.R.I.S." (Regional Strategic Intervention Programs) established by the Regional Law n. 39/2007. The aim of the P.R.I.S. is to guarantee the social protection of citizens that reside (as owners or tenants) or carry out economic activities in real estate units incompatible with the construction of the infrastructure, according to the main Italian law (Presidential Decree n. 327/2001) about the expropriation of private real estate for the construction of public works. In particular, the construction of a new link of the A7-A10-A12 motorway sections near the city of Genoa (called "Gronda") is considered. The new infrastructure involves the expropriation of about 100 residential units and the relocation of about 50 production activities; the related P.R.I.S. defines the conditions that allow social cohesion through the recognition of indemnities for the expropriation of the real estate properties and the compensation of other expenses that the residents have to pay for their relocation. The valuation of the indemnities is developed through a multi-parameter model applicable for the estimation of real estate units (residential and productive) at a large-scale (mass appraisal); it is derived from the Market Comparison Approach and considers the most meaningful real estate characteristics. The aim is to develop a mass appraisal estimation model applicable in an easy way on real estate units with different destinations use. The model can be applied for the estimation of ordinary and special indemnities to be recognized for owners and tenants affected by the expropriation of their real estate units for the construction of public projects.

Keywords: road infrastructures; social sustainability; real estate appraisal; mass appraisal; Regional Strategic Intervention Programs

1. Introduction

The planning and construction of public works and infrastructures—such as roads or railways—are characterized by complex legislative and procedural procedures, which often lead to uncertain times and results. In many countries, moreover, an approximate design of the works is characterized by phenomena of corruption between the client and the contractor, which frequently leads to a significant increase of final costs as well as a poor quality of the works and, consequently, high costs of maintenance over time.

The success of an infrastructure project is strongly conditioned both by a right assessment of the technical feasibility and by the economic, environmental, and social sustainability.

The concept of sustainability and sustainable development has been stated by the Brundtland Commission [1], which defines it as development that meets the needs of current generations without compromising the ability of future generations to meet their needs.

In accordance with the three dimensions involved in the concept of to the sustainable project [2], some recent infrastructure studies have declined them as follows:

- Social sustainability, understood as the impact of the infrastructure on local populations in terms of the possibility, even for those with lower income, to access and dispose of the services generated by the infrastructure (use, etc.) [3];
- Environmental sustainability, understood as an impact of the infrastructure on the quality of services (well-being, quality of life), on the environment (healthiness of the area, water, reduction of urban congestion, etc.) and on natural ecosystems (maintenance of animal and plant species) [4];
- Financial sustainability, understood as a correct evaluation of the economic resources necessary for the construction and management of the works over time [5].

Although the assessment of the sustainability of infrastructure projects has not been investigated as much as those regarding the projects at buildings scale, several authors have addressed the topic by testing or developing evaluation methods that take into account the different aspects of sustainability [6–16].

The social dimension of the project is one of the most critical issues, especially when these are located in densely urbanized areas; it implies the evaluation of many different effects derived from projects as: Creation of jobs; quality change in transport; noise and air pollution; expropriation of real estates; inconveniences derived by the construction sites during the building phase. Within the evaluation of the sustainability, the social dimension is also the least considered [17,18], while the economic performance is always considered [19–21]. If the social dimension of an infrastructure project is not carefully evaluated, this can produce negative effects on the project, society [22,23], and also on future generations [24–26]. One of the main reasons is that many social aspects are difficult to defined and evaluate [27] in qualitative or quantitative way; they depend on the type of infrastructural projects, local territorial characteristics, and participants perspectives [19,28,29].

The criteria and indicators of social sustainability must be defined through the involvement of the different stakeholders (citizens, etc.); one of the most critical aspects of the social sustainability of an infrastructure project is related to the consent of citizenship directed interest to the infrastructure.

To promote a higher level of participation of citizens and other stakeholders within the planning and design phase of public works, the Italian Decree of the President of the Council of Ministers n. 76/2018 have introduced the "public debate". All the interested population can participate in the debate, mediated by experts unrelated to the developers of the infrastructure. It allows citizens to discuss the opportunity to realize a certain project, its main objectives and characteristics, or the objectives of plans and programs, the socio-economic implications, and the main impacts on the environment and on the management of the territory. The public debate and the preliminary consultation also make it possible to discuss the various alternative solutions, including the possibility that the project is not carried out (the so-called "zero option"), and the methods of information and communication that must be guaranteed to citizens during the project realization process.

In order to facilitate the realization of new infrastructures in cohesion with the communities concerned, the Liguria Region has promulgated the Law n. 39/2007, in which the "Regional Strategic Intervention Programs" (P.R.I.S.) are established. With these programs, the Region—in agreement with the local public administrations and with the developers of the infrastructures—pursuing, at the same time, the requalification of the territorial contexts concerned and the social sustainability of the works, reducing the possible negative impacts on the local communities interested.

The projects can be financed with public and private resources, also through a project finance or another public-private partnership systems.

This study deals with the P.R.I.S. activated by the Liguria Region for the construction of the new connection of the motorway sections of the A7-A10-A12, near the city of Genoa. The aspects involved in the social sustainability of the project are investigated; in particular the estimation of the economic compensation that the developer of the infrastructure must pay to the owners and tenants of real estate that are expropriated, through the adoption of a large-scale evaluation method (mass appraisal).

2. The National Legislation on Expropriation Indemnities

The issue of social sustainability of infrastructures is closely connected to the impacts generated on the populations directly interested.

The impacts generated both in the construction phase (construction site) and during the useful life span of the infrastructure are the most critical issues in this type of works; they often create conflict between the citizens and the developers (public or private).

Among the many critical issues, the estimate of the economic indemnities for the expropriation of real estate units is one of the most delicate aspects within the process of planning and construction of an infrastructure.

In Italy, the law that establishes the methods of estimating the economic indemnities in case of expropriation of real estate units for the construction of works of public interest is the Presidential Decree n. 327/2001.

Article 32 of the Decree establishes that in the event of total expropriation of the real estate unit, the economic compensation that must be paid to the owner is equal to the market value of the real estate unit, estimated in relation to the characteristics surveyed at the date of the expropriation decree. This indemnity compensates the owner of the value of the expropriated real estate unit, but does not consider the inconveniences and other damages that arise because of its transfer (moving, notary fees for the purchase of a new home, other inconveniences, etc.). When the expropriation interests production units (companies), they may face additional expenses due to the need of locating their activities in temporary locations while waiting to find a real estate unit suitable to transfer their equipment.

The Decree also does not include any compensation to the tenants of the expropriated properties who must also face expenses for their move or the permanent negative effects caused to the owners of real estate properties located near the new infrastructure (e.g., the noise and atmospheric pollution produced by vehicles, for the negative impact on the landscape, etc.).

3. The P.R.I.S. of Liguria Region

The Law of the Liguria Region n. 39/2007 has identified the "Regional Strategic Intervention Programs" (P.R.I.S.) as tools to facilitate the realization of large strategic infrastructural works of national and regional interest by promoting social cohesion. The projects that can be developed through a P.R.I.S. are also public works that aim to mitigate the hydraulic and hydrogeological risk.

Through the P.R.I.S., the Liguria Region and Local Authorities (Municipalities) identify the solutions necessary to guarantee the sustainability of the impacts on the territory and on the community deriving from infrastructure projects. In particular, adequate economic and social protection measures are established in favor of the citizens that suffer the damages from the realization of the infrastructures (residents or owners of economic activities).

The P.R.I.S. provides—in addition to ordinary indemnity provided by Presidential Decree n. 327/2001—special indemnities for owners and tenants of the real estate units to be paid by the developers of the infrastructure.

This special indemnities compensate:

1. Costs for relocation, connection of utilities, and renovation in the case of residential properties;
2. costs for the renovation of the new real estate units;

3. costs for the transfer of the production activity and damage from the temporary production stoppage;
4. temporary and permanent inconveniences (construction site, noise pollution, etc.).

For cases 1 and 2, the special indemnity for each real estate unit is evaluated on the basis of its estimated market value; for cases 2 and 3 is to be determined case-by-case on the basis of an appraisal to be compared with the implementing entity for the verification of their congruity. For case 4, it is established by the Regional Law. Although the special indemnities compensate only a part of the inconveniences suffered by the citizens interfered with by the new infrastructures, it represents a valid and tangible economic aid that allows a more favorable—and in many cases better—relocation than the previous one.

The ordinary and special indemnities established by Presidential Decree n. 327/2001 and by the Regional Law n. 39/2007 are shown in Table 1.

Table 1. Figures and indemnities.

Figure	Ordinary Indemnity Pres. Decree n. 327/2001	Special Indemnity Regional Law n. 39/2007 (P.R.I.S.)
Owners of housing units in which they are residents	Market value of the expropriated real estate unit	40,000 € for adaptation of new accommodation and new connection (art. 6, paragraphs 1–2–3):
Owners of housing units expropriated but not residents	Market value of the expropriated real estate unit	
Tenants of expropriated housing units in which they are residents		- 30,000 € for adaptation of new accommodation - 10,000 € for moving and new connection (electricity, etc.)
Owners of production and/or commercial companies, owners of the properties in which they operate	Market value of the expropriated real estate unit	Removal costs and production stoppages to be estimated by appraisal (art. 6 bis, paragraphs 2–3)
Manufacturing and/or commercial business owners who carry out business in properties where they are tenants		Removal costs and production stoppages to be estimated by appraisal to be estimated by appraisal (art. 6 bis, paragraph 2)
Owners or tenants residing in buildings facing the construction sites (range 30–60 m away) installed for the construction of the infrastructure works.		40,000 € for temporary and permanent inconvenience (art. 6, paragraph 1)

During the 2009/2019 decade of application of Regional Law n. 39/2007, fourteen P.R.I.S. have been activated on the territory of the Liguria Region: seven approved (which will be followed by the signing of the related Program Agreements between the Liguria Region, local municipalities, and others authorities); four in progress; three proposed (Figure 1).

The P.R.I.S. are largely related to the construction of road and motorway infrastructures and involve a large number of citizens affected; less numerous are those activated for railway works, however, they have a great social impact as they are projects involving highly populated areas.

Each P.R.I.S. has a Technical Committee which performs guidance, coordination, and consultative functions regarding the application of the Regional Law (Liguria Region, local municipalities, and any other interested parties compose the Technical Committee.); all social criticalities manifested by citizens are collected by the Technical Committee, which analyzes the different requests presented and tries to solve them together with other local public administrations. In case of need, it activates the social services of the local municipalities concerned for psychological and social support to the citizens.

Taking as reference the project for the construction of the new sections A10-A7-A12 motorway connection, this study reports the estimation methodology developed for the verification of the indemnities to be paid to the owners of residential and production properties that interfere with the construction of the new infrastructure. In particular, a mass appraisal model is applied for the estimation of ordinary and special indemnities for the two types of real estate units.

Approved	Under construction	Proposed
4 Aurelia bis road Savona	11 Railway junction Genoa	1 Aurelia bis road Imperia
5 Giotto street Genoa	12 3td railway pass Genoa	2 Doubling road Andora-Finale Ligure
6 Fegino road junction Genoa	13 Motorway junction A10-A7-A12 Genoa	3 New subway section Genoa
7 S. Benigno road junction Genoa	14 Maersk platform for container Vado (Savona)	
8 New Polcevera bridge Genoa		
9 Felettino hospital La Spezia		
10 Aurelia bis road La Spezia		

Figure 1. P.R.I.S. (Programmi Regionali di Intervento Strategico—Regional Strategic Intervention Programs) of Liguria Region (Source: Liguria Region).

4. The Case Study: The New Highway Connection Called "Gronda"

The project for the new motorway connection between the sections of the A10-A7-A12 near Genoa (called "Gronda") aims to highlight—from the city of Vesima (Voltri)—the flow of traffic from the A10 and directed towards the A7 (to Milan) or A12 (to Livorno). Today, all the traffic flow passes through the Genoa west node, already heavily characterized by vehicular traffic to the city and goods traffic to the port (Figure 2).

Figure 2. New connection between A10, A7, and A12 near the Genoa junction. (Source: Autostrade per l'Italia S.p.A.).

The project was presented by "Autostrade per l'Italia S.p.A." (ASPI) (concessionaire company) at the Ministry of Infrastructure and Transport in 2008 and the following year (2009), and on the initiative of the Municipality of Genoa, the public debate was launched in which citizenship had taken part; the citizens analyzed five different alternative routes of the new infrastructure.

On the basis of the observations, a new route was therefore identified; decrease the impact on the city by reducing the number of interfering buildings. Following the environmental impact assessment and the following Services Conference (2014–2015), ASPI then presented the final design of the new infrastructure with the required additions (Figure 3).

Figure 3. The new bridge on the Polcevera River. (Source: Autostrade per l'Italia S.p.A.).

In 2017, the Ministry of Infrastructure and Transport approved the final project and declared the public utility of the new infrastructure. On the base of the Regional Law n. 39/2007, the P.R.I.S. and the related Technical Committee was established (The Technical Committee of the P.R.I.S. "Gronda" is composed by the Liguria Region; Municipality of Genoa; the Union of the Chambers of Commerce of Liguria; Chamber of Commerce, Industry and Crafts of Genoa (C.C.I.A.A.); ASPI; Liguria Energy

Recovery Infrastructures (I.R.E.)). In particular, the P.R.I.S. "Gronda" has the objective of addressing the critical issues related to the expropriation of real estate units that interfere with the infrastructure, ensuring adequate compensation for both owners and other interested parties (tenants), with a view to social sustainability.

The real estate units interfering with the infrastructure have residential or productive destination use. With the aim of defining the right indemnities to be recognized for their expropriation, the Municipality of Genoa has instructed the authors to verify the indemnities established by the ASPI technicians, in relation to the indications established by the Presidential Decree n. 327/2001 and by the Regional Law n. 39/2007.

In particular, the request is the estimation of the ordinary and special indemnities that must be recognized to the owners of each expropriated real estate unit.

5. The Estimation of the Indemnities for Residential Properties

5.1. Estimation of Ordinary Indemnities for Residential Properties

For the estimation of the ordinary indemnities for the owners of residential real estate units expropriated, the Presidential Decree n. 327/2001 has been considered; article 32 states that "the expropriation indemnity is established on the characteristics that the unit has at the date of agreement with the Public Administration or at the date of the expropriation decree".

Overall, the residential real estate units under expropriation are 99 (Figure 4); they belong to two different types of buildings:

- Real estate units within multi-family buildings located in the districts of: Bolzaneto (40); Voltri (6); and Sampierdarena (18) for a total of 64 units (Figure 5—left);
- Single-family buildings (called "scattered houses") located in the districts of: Voltri (11), Bolzaneto (15), Rivarolo (5), and Sampierdarena (4) for a total of 35 units (Figure 5—right).

Figure 4. Districts of Genoa where the real estate units are located (blue zone). (Source: www.immobiliare.it).

Figure 5. Example of a condominium building (left) and a single-family house ("scattered houses"—right) (source: Authors).

5.2. The Mass Appraisal Model

For the estimation of the ordinary indemnity related to the expropriation, a multi-parameter model has been applied, derived from the Market Comparison Approach (MCA); this type of estimation model allows for the estimation of large quantities of properties (mass appraisal) considering a series of real estate characteristics [30–36].

In order to define the multi-parameter estimation model, a survey is developed on the real estate market segments in which the real estate units are located; seven characteristics were selected with the collaboration of some local real estate agents and based on the results obtained from previous studies on the local real estate market [30,37,38], in particular:

1. Dimension (sqm);
2. age of building;
3. type of building;
4. maintenance state;
5. floor level;
6. lift (or not);
7. accessibility.

Although in a small number, the characteristics selected are meaningful to represent the value- of residential real estate units that must be estimated (subjects).

For each subject, the qualitative and quantitative status of the selected characteristics are measured.

For the application of the model, in collaboration with some local real estate agents, 24 comparables have been identified (10 for the real estate unit in multi-family buildings, and 14 for the single-family buildings). Priority is given to the location of the comparable within the same OMI (Observatory on Real Estate Market of the Italian Ministry of Revenue) zone; when this is not possible, an adjustment is made to the unitary price of the comparable by calculating a "zonal adjustment" coefficient (Kz) by comparing the average unitary value of the OMI zone within the subject is located with the average unitary value of the OMI zone where the comparable is located.

The values assumed by the Kz coefficient vary from 0.55 to 1.00.

Following the evaluation of the qualitative status of the selected characteristics, a coefficient is therefore associated for each subject and comparable; it represents how the value of the real estate units (subjects and comparables) varies compared to the price of a "new" real estate unit (that is, in excellent general condition) located within the same zone of real estate market.

The coefficients associated with the state of each characteristic are determined from the literature. With regard to the maintenance state, the age and type of building is assumed to be a single coefficient, as reported in the following Table 2 [39].

Table 2. Coefficients adopted for the age, quality, and condition of the residential real estate units.

Age and Type of Building	Excellent State	Good State	Mediocre State	Bad State
New				
Luxury	1.10	-	-	-
Stately	1.05	-	-	-
Medium	1.00	-	-	-
Popular	0.90	-	-	-
Ultra-popular	-	-	-	-
Very recent				
Luxury	0.95	0.90	0.85	-
Stately	0.90	0.85	0.80	-
Medium	0.85	0.80	0.75	-
Popular	0.80	0.75	0.70	-
Ultra-popular	-	-	-	-
10–20 years				
Luxury	0.90	0.85	0.80	-
Stately	0.85	0.80	0.75	-
Medium	0.80	0.75	0.70	-
Popular	0.75	0.70	0.65	-
Ultra-popular	-	-	-	-
21–40 years				
Luxury	0.85	0.80	0.75	0.65
Stately	0.80	0.75	0.70	0.60
Medium	0.75	0.70	0.70	0.60
Popular	0.70	0.65	0.60	0.50
Ultra-popular	-	-	-	-
41–60 years				
Luxury	0.80	0.75	0.70	0.60
Stately	0.75	0.70	0.65	0.55
Medium	0.70	0.65	0.60	0.50
Popular	0.65	0.60	0.55	0.45
Ultra-popular	-	-	-	-
Over 60 years				
Luxury	0.75	0.70	0.65	0.55
Stately	0.70	0.65	0.60	0.50
Medium	0.65	0.60	0.55	0.45
Popular	0.60	0.55	0.50	0.40
Ultra-popular	0.55	0.50	0.45	0.35

For the accessibility to the building and the floor level (with or without lift within the building), the coefficients shown in Tables 3 and 4 are adopted.

Table 3. Coefficients by level of accessibility to the building.

Building Accessibility Level	Condominium Properties	Single-Family Buildings
Easy accessible	-	1.00
Accessible	1.00	0.90
Moderately accessible	0.95	0.80
Accessible with difficulty	0.90	0.70

Table 4. Floor level coefficients in the presence and absence of the lift.

Floor	With Lift	Without Lift
Underground/basement	0.850	0.800
Ground level	0.900	0.900
Between ground level and 1st	0.900	0.900
1st	0.980	0.960
2nd	1.000	1.000
3rd	1.000	0.950
4th	0.980	0.920
5th	0.970	0.850
6th	0.960	0.750

The values are determined by analyzing previous studies [39–44] and taking into account the specific building characteristics of each subject.

Based on the analysis of the qualitative state of the characteristics, for each subject "i" three coefficients "k_i" are then calculated.

- The first (ki_1) is expressive of the age, the type of building, and the maintenance state of the real estate unit. For the subjects analyzed, it varies from 0.35 to 1.10;
- The second (ki_2) is expressive of the level of accessibility to the building. For the subjects analyzed, it varies from 0.70 to 1.00;
- The third (ki_3) is expressive of the floor level in the presence or absence of the lift. For the subjects analyzed, it varies from 0.750 to 1.00.

Similarly, for each comparable "j"—with a selling price equal to P_j—the same three coefficients "k_j" (k_{j1}, k_{j2}, k_{j3}) are calculated.

For each real estate unit, the total coefficient and the sum of the coefficients attributed in relation to the characteristics of the three state are then calculated, namely:

- For subjects:

$$Kt_i = k_{i1} + k_{i2} + k_{i3;}$$

- for comparables:

$$Kt_j = k_{ij1} + k_{j2} + k_{j3}$$

The difference between the total coefficient calculated for the subject "i" (Kt_i) and for each comparable "j" (Kt_j) therefore represents the correction (positive or negative) to be applied to the price of each comparable. The "adjusted" price is the price that the comparable "j" should have had in the case of perfect equality of characteristics with respect to the subject.

The coefficient KT_{ji} is given by:

$$KT_{ji} = Kt_i - Kt_j$$

The "adjusted" price $P_{j'i}$ of the comparable "j" is therefore given by:

$$P_{j'i} = P_j \times KT_{ji}$$

For each comparable the "adjusted" price is then calculated with respect to each subject "i"; dividing each "adjusted" price $P_{j'i}$ by its dimension (SC_j), the "adjusted" unitary price $p_{j'i}$ is then determined:

$$p_{j'i} = P_{j'i}/SC_j$$

The average of the "adjusted" unitary prices therefore determines the average unitary value Vu_i of the subject "i".

$$Vu_i = p_{j'i} \text{ average}$$

The most probable market value V_i of each subject "i" is obtained by multiplying its dimension (SC_i) by the unitary value Vu_i.

$$V_i = Vu_i \times SC_i$$

Considering that the selected comparables were sold in 2016, the estimated values were therefore referred to in the second half of 2008, as established by the agreement between the Liguria Region, the Municipality of Genoa, and ASPI. In particular, to each estimated price is applied an "adjustment" coefficient calculated on the basis of the percentage change in the unitary average prices of residential properties detected within the OMI zone where the subject is located.

5.3. Results

The analysis of the results obtained from the model shows that the unitary values of the subjects vary between a minimum of 1074 €/sqm and a maximum of 1589 €/sqm. It should be noted that in the Campasso zone (Sampierdarena district—OMI zone C21), the minimum estimated unitary value (equal to 1074 €/sqm) is slightly below the minimum unitary value detected by the OMI in 2008 (1180 €/sqm) while in the Voltri district (OMI zone D34), the maximum estimated unitary value (equal to 1227 €/sqm) is higher than the maximum unitary value reported by OMI (equal to 1109 €/sqm).

A careful check shows that the minimum value of Sampierdarena relates to a real estate unit in poor maintenance conditions, while the second relates to a real estate unit in excellent condition (recently renovated and a high level of finishes); both belong to the type of real estate unit located in multi-family buildings.

5.4. Estimation of Special Indemnities for Residential Properties

The special indemnities are estimated according to the Regional Law n. 39/2007. The values are established by the Regional Law and no expert report is required (Table 1).

These indemnities are equal to 30,000 € for the adaptation costs (building renovation) of the new real estate unit and 10,000 € for the costs of moving house and connection of the new utilities (electricity, gas, etc.). In the case of a leased real estate unit, the special indemnity is due to the resident tenant.

Furthermore, the Regional Law n. 39/2007 recognizes to residents who live within the range of 30 to 60 m from the new infrastructure (not affected by any expropriation), a special indemnity equal to 40,000 € for the damage caused by temporary (building site) and permanent inconvenience (noise, atmospheric pollution, negative landscape impact).

5.5. Estimation of Ordinary Indemnities

The real estate units are located in the districts of Voltri (2-OMI zone D35), Cornigliano (2-OMI zone D46), and Bolzaneto (32-OMI zone D29). The properties located in the Bolzaneto district are all within a building (called "Ciari") built at the end of the 1990s with a prefabricated concrete structure (Figure 6).

Figure 6. "Ciari" building in Bolzaneto district (Source: Authors).

Unlike residential real estate units, at the time of estimation (2018) it was not possible to find a set of comparables in the same market zones where the subjects are located; then a multi-parameter estimating model is adopted based on the analysis of the qualitative-quantitative status of 12 real estate characteristics and their relative contribution (weight %) to the composition of the total real estate value (Table 5).

Table 5. Real estate characteristics considered in the estimate model and weight (%) of total real estate value.

Characteristic	Weight (%)
Road accessibility	12.60
Commercial context	12.00
Vehicle accessibility	10.80
Public transportation available	4.50
Real estate unit size	8.00
Internal distribution of real estate unit	6.90
Structure, cover, windows	10.30
Building maintenance	12.30
Electrical system	7.30
Heating system	4.50
Accessory systems	3.50
Plant maintenance state	7.30
TOTAL	100

For each productive real estate unit (subject) "i", the real estate value (V_i) can be estimated as follows:

$$(10 - 6):(910 - 630) = (S_i - 6):(V_i - 630)$$

Then:

$$V_i = 630 + ((770-630) \times (P_i-6)):(10-6)$$

where:

- S_i = total score attributed to the subject "i";
- 630 €/sqm = minimum unitary value detected by the OMI for zone D29;
- 910 €/sqm = maximum unitary value detected by the OMI for zone D29.

The unitary value obtained through the application of the estimate model range from a minimum of 420 €/sqm (for a real estate unit located in the OMI zone D35 of Voltri) to a maximum of 762 €/sqm (for a real estate unit located in the OMI zone D29 of Bolzaneto within the "Ciari" building).

5.6. Estimation of Special Indeminties

The estimation of the special indemnities—related to the real estate component only—is considered in article 6 bis—paragraphs 2–3—of Regional Law n. 39/2007; in particular, are estimated the costs of redevelopment (related to the works of adaptation for electrical systems, etc.) of the new real estate unit to which the economic activity will be transferred.

This indemnity is correlated to the state of the expropriated real estate units, i.e., the qualitative state of equipment, spaces, and facilities for complementary activities (offices, meeting room, etc.); in this way, the costs that the owner will incur to reproduce the spaces and fittings necessary for production are recognized, as they are currently detectable in the real estate unit expropriated.

The estimation of the indemnity is developed considering an average unitary cost of restructuring and adaptation of new real estate unit (considering only workings like painting, new connections for electrical and heating systems, etc.) and the unitary cost for the adaptation and restructuring for new office spaces.

The unitary average costs estimated are equal to 200.00 €/sqm for the adaptation and restructuring of production spaces, and 350.00 €/sqm for the adaptation and restructuring of office spaces. In order to estimate the indemnity, the aforementioned unitary costs are therefore referred to the status of 6 (Table 6) of the 12 characteristics considered in the previous estimation for ordinary indemnity (Table 5).

Table 6. Characteristics considered for the estimation of special indemnity.

Characteristic	Weight (%)
Structure, cover, windows	10.30
Building maintenance status	12.30
Electrical system	7.30
Thermal system	4.50
Accessory systems	3.50
Systems maintenance status	7.30
TOTAL	*45.20*

The six characteristics considered are relevant for assessing the maintenance and plants status of the real estate units (including office space) and together make up 45.20% of the real estate value.

For each subject, the weighted score obtained for the 6 characteristics (S_{i6}) in the previous estimate is then compared with the weighted score obtained by attributing the score 10 to each of the same 6 characteristics (equal to 4.52).

The unitary cost that is possible to recognize for restructuring and adaptation of productive space in the new real estate unit is equal to:

$$\text{Cu adjustment} = \text{Cu average} \times (S_{i6}/4.52)$$

For the adaptation of space for production uses, the unitary cost (Cup_i) is equal to:

$$Cup_i = 200.00\ €/\text{sqm} \times (S_{i6}/4.52)$$

For the adjustment of office space, the unitary cost (Cuo) is equal to:

$$Cuo_i = 350.00\ €/\text{sqm} \times (S_{i6}/4.52)$$

The unitary costs recognized for restructuring and adaptation of productive spaces vary from a minimum of 100 €/sqm to a maximum of 200 €/sqm, while the one for adjustment of office spaces vary from a minimum of 175 €/sqm to a maximum of 350 €/sqm.

Based on the inspections carried out within each properties, it is found that the average incidence of the spaces for production activities is equal to 80% of the total area, while the remaining 20% is for office and meeting spaces.

For each subject, the total special indemnity (Isi) to be recognized for the adaptation works is obtained by multiplying the unitary costs before calculating the total surfaces (for production and office use) detected by design and checked by direct inspections.

$$Is_i = Cup_i \times SC_i \times 0.80 + Cuo_i \times SC_i \times 0.20$$

The values of the indemnities recognized vary from a minimum of 33 thousand € to a maximum of 297 thousand €; the incidence of the special allowance varies from a minimum of 4.2% to a maximum of 27.9% of the overall economic amount paid to the owner (excluding the allowances for the move and for production stoppage). In case of rental of the propriety, this indemnity must to be paid to the tenant.

6. Conclusions and Discussion

The social dimension of infrastructural projects is a very important aspect of global sustainability [19]; it must be considered as the other two dimensions (economic and environmental) because only a correct balance of the three components determines a good project [9].

An important aspect of social sustainability is related to the inconveniences deriving from the relocation of the residents or productive activities whose buildings interfere with the infrastructure.

The negative effects are both economic (related to the need to find a new property in which to reside or carry out productive activities) and psychological. They must be carefully evaluated to avoid that the benefits of the new infrastructure are partially nullified by the negative effects that can be generated during the construction and management phases.

Considering the damage deriving from the expropriations of real estate units, the indemnities to be paid to the owners and tenants of the properties that interfere with the infrastructure must be calculated not only in relation to the market value of the expropriated building, but also of the other damages and inconveniences.

The Law of the Liguria Region n. 39/2007 deals with the issue of the realization of infrastructures of regional and national interest from a participatory perspective aimed at defining and resolving any problems that may affect (directly or indirectly) citizens and economic activities involved. In particular, through the P.R.I.S., the social sustainability of the infrastructure is addressed through the recognition of special economic indemnities for owners and tenants of real estate units that interfere with the infrastructures and other social support.

Unlike national law, the regional one improves social justice in case of expropriation because it recognizes that citizens have greater economic damage than only the market value of their expropriated properties.

Taking as reference the P.R.I.S. for the new A7-A10-A12 motorway connection near the city of Genoa, the paper deals with the estimation of ordinary and special indemnities through a multi-parameter estimation model.

Due to its application method, it derives from the Market Comparison Approach; it is configured as a model for the mass appraisal as it is applicable to a big number of properties in an easy way and represents a valid alternative estimation model applicable in estimative contexts that require reduced time and reliability of results. It can also be applied even in the presence of small data samples, overcoming the age-old problem of the reduced availability of data necessary for the estimates.

The values of ordinary and special indemnities thus estimated are verified by comparing them with those estimated by the technicians of the expropriating company and shared by the Technical Committee of the P.R.I.S.

Figure 7 shows the acceptance percentages of the economic indemnities by owners and tenants, distinguished by type of property. With regard to productive real estate units, the indemnities estimated through the model must be sum with the other recognized for production stoppage and moving.

The acceptance percentages of the allowances estimated with the multi-parameter model show a high degree of satisfaction, although the indemnities partially compensate all the inconvenience suffered (for example, do not consider for the residents, the damage for the removal from the places, and communities where they grew up and lived).

The economic indemnities—at least in part—contribute to the achievement of that social sustainability of the infrastructures that Regional Law has among the main objectives; at least, it is able to guarantee reasonable transfer alternatives for both residence and economic activities.

By means of the Technical Committee, the P.R.I.S. supports socially and psychologically the citizens interfered with by the infrastructure; for the P.R.I.S. "Gronda", four meetings with residents and business owners were organized to collect their requests and to explain what type of economic compensations will be recognized, how they will be estimated, what damages they will compensate, the estimating method utilized, and the modality for the recognition. During the first meeting, the owners of the residential properties appointed three representatives; they collaborated with the Technical Committee to resolve some specific critical issues related to the relocation of some elderly residents and the collection of technical information on their properties useful for the estimation.

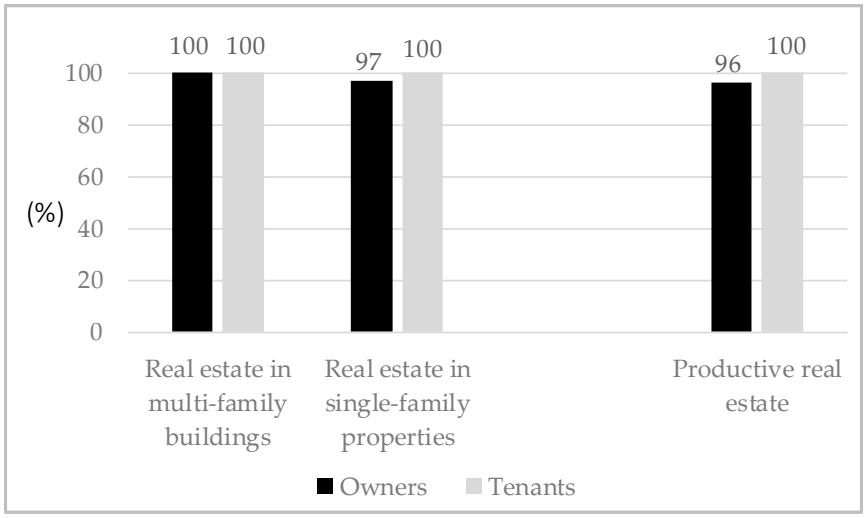

Figure 7. Percentages of ordinary and special indemnities accepted by owners and tenants.

These meetings—foreseen by the Regional Law between the tasks of the Technical Committee—allow from the outset to identify the individual critical issues affecting the individual citizens concerned and to define possible solutions in a coordinated manner with the other public administrations. In some cases, the social services of the municipality of Genoa were activated for the relocation of five residents in public residential buildings.

Today, more than thirty years after the introduction of the three sustainability paradigms, with the contribution of various authors, the concept of sustainability has evolved; among these, Pope Francis' Encyclical "Laudato si" whose concepts introduce new meanings of sustainability of human actions which go alongside the traditional ones and which can be so declined [45]: The project must be "Just" (social sustainability), "Beautiful" (environmental sustainability), and "Truthful" (economic sustainability).

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Article

Evaluating Outwards Regeneration Effects (OREs) in Neighborhood-Based Projects: A Reversal of Perspective and the Proposal for a New Tool

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Abstract: This paper proposes a reversal of perspective in the evaluation of Regeneration projects. Until now, attention has been mainly focused on project "internal effectiveness", in reference to the environment and life quality improvement of the areas directly affected by the interventions. The effects induced in the wider urban context are rarely sufficiently analyzed. This aspect instead opens an important field of investigation, useful for a broader assessment of regeneration initiatives, especially with regards to Public Housing Neighborhoods where the long-term project success also depends on the positive effects it generates in the surroundings. Therefore, the aim of this research is to develop a conceptualization of "Outwards Regeneration Effects" (OREs), based on an extensive literature review, and to make it operational through a conceptual framework for the qualitative analysis. The results of this study, on the one hand, highlight several critical issues raised by the interventions implemented so far, and, on the other hand, provide a more effective assessment framework, useful in the evaluation of future projects. Further developments of such an approach could lead to the development of operational evaluation models, combining both qualitative and quantitative indicators, starting from the implementation of the proposed analytic framework.

Keywords: urban regeneration; public housing neighborhoods; project-induced effects; assessment framework; multi-criteria decision-making model

1. Introduction

The regeneration of public housing neighborhoods periodically becomes a political and policy priority. This often occurs in periods of socio-economic crisis, during which specific interventions are promoted by central and local governments that allocate substantial funds in order to face an emergency condition. In this context, area-based initiatives are privileged because they respond to the need to identify priority project areas and to optimize economic resources. However, this approach, not being tied to long-lasting and overall development strategies, often does not trigger long-term transformation processes, bringing about a feeling of helplessness among administrators, economic operators, and citizens. In this way, the negative perception of deprived neighborhoods is often even further reinforced, producing a vicious circle from which it is difficult to escape.

According to these considerations supported by a literature review (Section 2), this paper suggests a reversal of perspective, shifting attention from the effects produced by interventions within the neighborhood which characterize the area-based approach, towards the effects on the surroundings, which are defined here as "Outwards Regeneration Effects" (OREs) (Section 3). To explain this concept, the proposed analysis refers to the study conducted by Peter Hall in the late 1990s, who highlighted the differences between an "inward-looking" and "outward-looking" policy approach to the regeneration of peripheral housing estates [1]. The first—typical locality-based regeneration policies—are directed

towards solving internal problems, largely ignoring the impacts of the external environment on the estate involved in the intervention and vice versa; the second pay attention to the external factors and their relationships with the area of intervention.

Hall's study is still very topical and can fruitfully be used as a theoretical basis to develop an operative assessment model for urban regeneration programs and projects. To that end, the proposed extension of Hall's approach allows passing from the analysis of outward-looking policies to the evaluation of the project-induced effects. By trying to overcome the area-based approach, in fact, the present proposal recognizes the main factors that affect the areas surrounding the project site, and hence propose a conceptualization of the Outwards Regeneration Effects (OREs). The purpose of this study is to develop a preliminary comprehensive framework for qualitative analysis for such OREs, useful to elaborate on more detailed evaluation models at a later stage.

In Section 4, some conclusive reflections on the usefulness of this framework are presented. On the one hand, OREs analysis provides an alternative explanation of the success/failure factors in regeneration projects; on the other hand, it offers a tool for quick assessment of the future projects' effects.

2. Literature Review

2.1. The Spatial Concentration of Decay and Poverty: An Effective Representation?

Since the 1980s, many governments have promoted a wide range of policy initiatives in order to ameliorate the conditions of deprived urban areas. Among these, EU countries are the most committed to the development of regeneration intervention, thanks to the financial support of the European Community, which has allocated specific funds for this purpose [2–8]. The rapid growth of cities after the Second World War, in fact, was mainly characterized by poor building and urban quality, especially in relation to infrastructure, services, and public space. This condition concerns, in particular, the public housing stock that revealed enormous social, environmental, and economic problems [9,10]. Public neighborhoods mainly on the outskirts of cities, in fact, have been largely recognized as sites of multiple deprivations, emblems of social and physical degradation, urban areas with a concentration of disadvantaged populations who do not have access to the opportunities available to other inhabitants of the city. For this reason, housing and neighborhood regeneration, by which we can "face equity issues most directly" [11] (p. 77), represents an important field of experimentation for design and planning projects, as well as one of the main priorities of the European sustainable development agenda [12]. Governments and public administrations, at least in theory, concentrate many public investments in poor and degraded areas, in order to redistribute material and nonmaterial benefits (goods and services) and to rebalance resources within different areas of the city. However, this concept of urban equity holds certain paradoxical elements both from a socio-spatial and economic-political point of view.

(1) The socio-spatial paradox. Referring to Nancy Fraser [13], Dlabac et al. [14] (p. 3) point out how "the claims for egalitarian distribution are being displaced by claims for the recognition of identity groups", instead of considering people of any social status as "full partners in social interactions" [15] (p. 377). In this way, the spatial concentration of poverty and degradation in certain areas risks becoming a self-sustaining process, highlighting causes of the disadvantage. In addition to the physical characteristics of the neighborhoods (such as isolated location, poor quality housing, poor services, public spaces, and green areas [16]), "territorial stigmatization" [17–21], produced by the institutions, investors, and other citizens, may play a decisive role [22–26], which tends to reinforce the conditions of the residents of deprived neighborhoods. Thus, as Wacquant [20] (p. 1273) suggests, "in every country, a small set of urban boroughs have come to be universally renowned and reviled across class and space as redoubts of self-inflicted and self-perpetuating destitution and depravity". This locational stigmatization creates a "topography of disrepute" that favors the production of lasting spatial structures of privilege and advantage [27]. For this reason, often stigma persists even after regeneration

interventions [28–30]. It follows that improving the neighborhood's reputation must be one of the priority objectives of the urban regeneration project (see: [31–33]).

(2) The political-economic paradox. The policies promoting a homogeneous distribution often generate the frustration of not being able to achieve this goal, not only for economic limits but also because a certain degree of distributional inequality is inevitable [34]. Referring to health services, Soja states that this depends in part on "the differential effects of relative location and distance friction on consumers and in part due to the locational decision made by individuals producing these services" [35] (p. 47). Criticizing Fainstein's theory of *The Just City* (2010) [11], Soja points out the need for "devising pro-active spatial strategies directed towards equal access to opportunities on a citywide scale" [14] (p. 1). This recalls Amartya Sen's capability approach, which in our context, may relate to equitable access to urban opportunities. This concept turns out to be particularly true in the context of globalization and its development logistics, where places must be considered active agents instead of inert containers [36] (p. 2), and their context is a potential activator of linkages with other places.

2.2. The Area-Based Initiatives: An Effective Approach?

According to the local area-based explanations of deprivation, many policies and studies claim that areas and problems are closely connected and consequently, to effectively face them—making governments more responsive, flexible, strategically focused, and integrated with their actions [37] (p. 318) —it is necessary to spatially delimit the area of intervention (e.g., [38–40]). The prevailing approach to urban regeneration, in fact, has been to clearly identify and define geographically the problematic areas in order to promote area-based initiatives (ABIs) focused on specific neighborhoods. However, the empirical evidence of the "area effects"—particularly for the most deprived communities—has been contested and often suggested to be inconclusive (see: [21,41–46]). For instance, through an ex-post assessment of the URBAN *Community Initiative* (1994–2006)—one of the most intensive area-based initiatives launched in Europe to deal with the problems of citizens living in disadvantaged urban areas—Carpenter [24] points at the continuous disbursement of financial resources by successive governments into often the same deprived areas, claiming that this represents a proof of failure. In this respect, we can summarize the main problems highlighted by the area-based approach in two points: (1) the selection of areas and the definition of intervention limits, and (2) the lack of interest in structural causes of deprivation.

2.2.1. The Selection of Areas and the Definition of Intervention Limits

The selection of deprived areas eligible for funds allocation was considered a strategy to simplify urban problems and to optimize resources [1] (p. 882). As Carpenter [24] (p. 2146) notes, the area-based initiatives "play a useful role for governments, as they reinforce the perception that deprivation only exists in a few well-defined areas. Limited resources can be channeled into delimited neighborhoods and therefore the impact is greater—to the credit of the government".

Following this logic, often the delimitation of the areas of intervention are defined by administrative boundaries or by indicators developed specifically for measuring poverty in certain areas, as in the case of the Index of Multiple Deprivation (IDM) initially developed for England in the 1990s [47–49]. In reality, it is difficult to define a map of the city by which poverty and degradation can be easily circumscribed to well-defined areas because each poor neighborhood is different from the others in terms of socio-economic conditions, cultural integration, and civic evolution [50]. As Galster [51] (pp. 2112–2114) suggests, "planners and policy-makers hope to identify behaviorally meaningful, unambiguous boundaries to devise more efficacious neighborhood indicators and interventions, but the task often is confounded by a lack of congruence among local actors' perceptions of boundaries (...) It is precisely these perceptions of boundaries that are most critical in constructing theories or predictive models of neighborhood change".

Furthermore, often "much poverty lies outside areas that score highly on indices of multiple deprivations and not everyone in these areas is poor" [52] (p. 23). A significant number of poor

people, in fact, are not geographically concentrated in areas that are classified as "deprived" [53,54], as in the case of low-density urban areas and rural areas [55,56]. As noted by Midgley et al. [57], the application of the same deprivation measures to different contexts can be misleading. Due to the variety of territorial contexts and observable problems, the choice of indicators and analysis domains may risk looking arbitrary [58]. Consequently, "the dividing line between those clusters that are of public concern and those of no public policy interest is not always clear" [59] (p. 15), and policies in favor of selected neighborhoods can become a form of spatial injustice [60].

2.2.2. The Lack of Interest for Structural Causes of Deprivation

In many neighborhood regeneration programs, there is a significant lack of recognition of the structural nature of deprived areas [61] (p. 768) and many such programs propose projects in "splendid isolation" [62]. With relatively cheap initiatives, ABIs allow governments to obtain visibility without having to face more complex issues [2]. Therefore, interventions on physical renewal—"highly visible and relatively easy for governments to engineer" [36] (p. 6)—have often been preferred. However, as Marcuse [63] claims, spatial remedies are necessary but not sufficient to address spatial injustices. It follows that ABIs risk becoming a kind of "curative form of urbanism" [64] (p. 619) that "reaffirms the pathological nature of neighborhood deprivation, whereby their internal characteristics are seen as the cause of the problem rather than as a symptom of wider structural factors" [65] (p. 335). In the absence of broader economic progress and deeper social reforms, physical improvements often prove ineffective over time. Problems, in fact, "may be apparent within, but are not of, areas" [44] (p. 528). In this respect, neighborhood deprivation must be assumed as a complex phenomenon, whose causes of the problems and the potential solutions often lie outside its local perimeter. As a result, the problems cannot be solved at the neighborhood level [66,67], "the geographical scale across which an attribute varies often is wildly dissimilar among attributes" [51] (p. 2113). For this reason, in a multi-level spatial view of neighborhoods [68], programs and methods for distributing funds should consider the different scales at which problems arise and have some degree of flexibility to be able to make the best possible use of available information to guide decisions. For example, if the improvement of livability can be easily addressed on a neighborhood scale, especially through the improvement of the public spaces, other interventions aimed at economic development need a larger area approach. For instance, applying this reasoning to the employment policies, we can easily observe that "there would be no rationale for trying to increase the number of jobs available in a small area if it was already surrounded by areas where job availability was very high" [69] (pp. 69–70).

Observing many government initiatives in Europe and the United States, Todes and Turok [36] (p. 6) highlight the lack of concrete commitment to rebuild local economies and to create new jobs: "at worst they merely ameliorated poor living conditions, instead of being catalysts for socio-economic development". For this, it proves necessary to consider the uneven economic gains of distribution processes that limit the access to the labor market or credit services for inhabitants of degraded areas [70] and favor the concentration of wealth away from disadvantaged people and places [24] (p. 2146). Furthermore, "problems of duplication and overlap may arise in relation to policy issues and the targeting of clients and/or areas" [71] (p. 96) which may simply displace problems between different neighborhoods without addressing the overall economic and social well-being of the city as a whole [39]. ABIs, in fact, are only part of any solution [50] and they cannot solve the "global" problem [72].

3. A Conceptual Framework for Outward Regeneration Effects (OREs) Analysis

From the previous considerations, it appears that if many questions remain unresolved, it is in part due to the inability to represent the deprived neighborhoods as the outcome of an articulated and heterogeneous set of complex interconnected and multi-scalar processes and, therefore, to understand the extent of the effects that each intervention can produce in the wider urban context, and vice versa.

3.1. From Inward to Outward-Looking Approaches to Housing Regeneration

An interesting conceptualization of the critical issues described previously is provided by Peter Hall [1] who, while analyzing the regeneration policies applied since the mid-1980s in England and Scotland, highlighted the prevalence of an "inward-looking" approach, aimed at identifying and solving internal problems (spatial and social characteristics of the neighborhood itself). In contrast, external problems (economic, social, and political characteristics of the wider city environment), referred to as an "outward-looking" approach, are not adequately taken into account. The differences between these two approaches are highlighted in Table 1.

Table 1. Inward and outward-looking regeneration policies (source: [1]).

Policy Aspect	Policy Focus	
	Inward-Looking	**Outward-Looking**
Environment, Access, and Amenity	• improve environment and provision of amenities for locals	• overcome physical isolation • transport planning • improved amenity to attract outsiders
Housing	• improve housing conditions and diversify tenure for locals • decentralized management	• improve housing to attract new residents • attention to city-wide housing allocation processes
Social Regeneration	• community/tenant involvement • crime strategies • stabilization of existing population	• measures aimed at overcoming stigmatization and social exclusion
Economic Regeneration	• local employment in estate management and construction • small business development and training	• education • recruitment and placement • linking estate to sub-regional development • attracting inward investment
Institutional Arrangements	• emphasis on tenant and housing associations control: area-based partnerships	• emphasis on city-wide partnerships • emphasis on linkages between institutions
Spatial Scale	• area-targeting of estate • strongly decentralized planning approach	• linkage of areas of deprivation and potential • city-wide strategic planning

However, despite Hall's holistic view of urban problems and policies, his examination of the outward-looking approach is mainly aimed at evaluating the "inward effects" to the project area. What the urban context gains or loses from the project is not the focus. The extension of Hall's analysis in this direction can provide useful elements for understanding the set of direct and indirect effects on the surroundings that any intervention can generate. Each renewal project, in fact, may permeate outside the area where it is implemented [73] and produce positive or negative post-development "externalities" on its neighborhoods, which must be carefully evaluated. As noted by Melo and Cruz [74] (pp. 1–4), "the effects of urban renewal are wider than the physical assets under intervention and have social, economic, and environmental implications to agents (owners, tenants, local businesses, etc.) that are not involved in the renewal processes. . . . Quantifying externalities should be considered as the starting point to the improvement of those relations between neighborhoods, contributing to an overall improvement of the city".

For all this, a comprehensive evaluation of inward and outward regeneration effects allows for the understanding of the impacts of projects/programs and can constitute one of the strongest arguments available from public administration for justifying any renewal intervention. This can seek to unseat, not only conceptually but also operationally, an inward based approach, which, as previously described, is still prevalent. Above all, it answers a fundamental question: "who are the neighborhood-based policies designed for, and who will these policies disadvantage either intentionally or unintentionally? " [75]. According to Miceli et al. [76], quantifying externalities is the starting point to the improvement of those relations between neighborhoods, improving the city to which they belong. To this end, the next paragraph introduces the concept of "Outward Regeneration Effects" (OREs), identifying some main categories of analysis. Figure 1 schematizes, through a system of concentric circles, the neighborhood where regeneration actions are foreseen, its surroundings, and the wider urban context where the outwards effects are expressed.

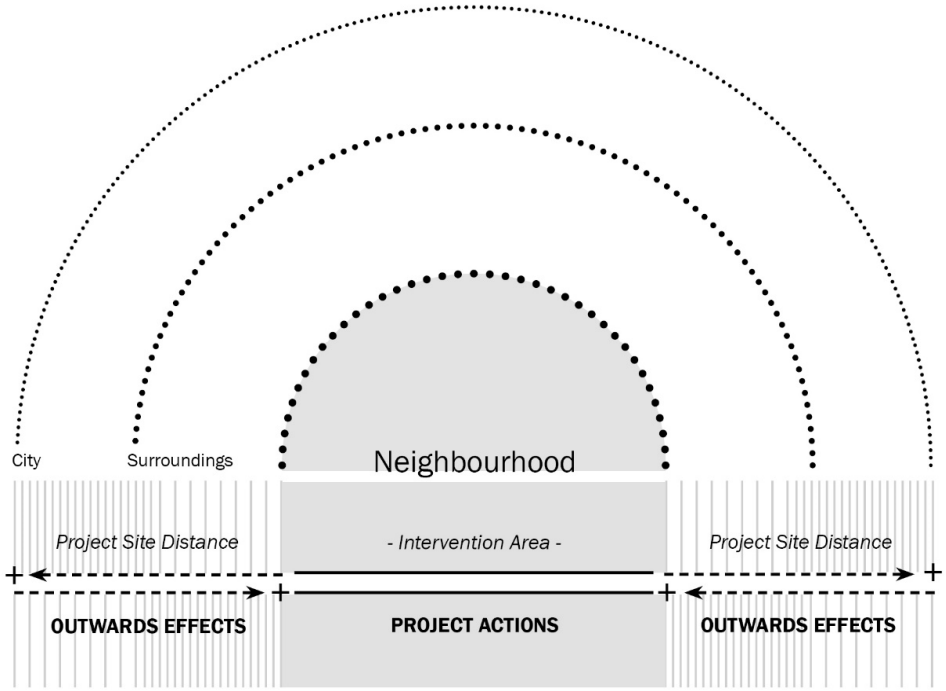

Figure 1. Outward Regeneration Effects (OREs): explanatory scheme. In the center, the renewed neighborhood (intervention area) and the subsequent levels corresponding to the urban context in which the effects of intervention occur, the surrounding neighborhoods and the whole city context, respectively.

3.2. OREs: Definitions and Qualitative Evaluation

In order to move from theory to practice—with reference to the extensive literature review mainly based on case study analyses discussed in the two next sub-paragraphs (Sections 3.2.1 and 3.2.2)—the outward-looking policy focus identified by Hall has been associated with a series of Outwards Regeneration Effects (Figure 1, Table 2). These were put in the form of questions, as a preliminary questionnaire to be submitted to local administrators and planners. Each of these—described in the literature in terms of impacts, externalities, spillover effects, etc.—have typically been analyzed independently of one another, in reference to a specific sector of analysis (economic, social, transportation, etc.). The usual approach, in fact, is to take some aspect of data to capture and represent a given phenomenon. Nevertheless, if we only focus on a single effect, we risk underestimating the overall effect's size. Therefore, this study proposes a comprehensive conceptual framework for the qualitative analysis of project actions and their induced effects.

Table 2. The outward-looking approach and its corresponding Outwards Regeneration Effects.

Outward-Looking Approach		Outwards Regeneration Effects **
Objectives *	**Actions ****	**Preliminary Questions**
1. Accessibility and Attractivity • Create new spatial and functional relationships with neighboring areas • Overcome physical isolation • Attract outsiders	• Improve public transport and soft mobility • Enhance amenities and commerce	• What spatial and functional relationships are defined between neighboring neighborhoods? • Do new transport networks ameliorate the connectivity of surrounding neighborhoods? • Do new amenities and commerce expand the offer already present in the surrounding urban area?
2. Housing Implementation • Attract new residents • Diversify the housing offer	• Recovery and enhancement of existing housing stock • Develop new housing, especially urban infill	• Does housing improvement cause a rise in prices of surrounding residential markets? • Does the new housing offer expand the residential choice by providing alternatives in the neighboring housing market?
3. Social Regeneration • Overcome stigmatization and social exclusion • Enhance human and social capital	• Improve public spaces and green areas, goods, and social welfare services • Expand the educational and cultural offerings	• Are the new public spaces and green areas, goods, and social welfare services attractive to neighboring communities, and are the interactions between inhabitants of different neighborhoods encouraged? • Are the new educational and cultural offerings also addressed to the inhabitants of the nearby neighborhoods?
4. Economic Regeneration • Expand the recruitment and placement • Link real estate to sub-regional development • Attract outward investment.	• Create new jobs • Identify the economic role of the neighborhood in the wider city systems • Attract external economic resources for the intervention implementation in order to compensate for inward and public financial cuts	• Do employment policies provide an attractive complementary offering or do they simply displace employed people residing elsewhere? • Do the new economic activities build a differentiated offering compared to the activities already present in the surrounding area? • Do the investments have an economic return on neighboring neighborhoods?
5. Inter-Institutional Cooperation Arrangements • Foster the city-wide partnerships • Facilitate the cross-scale institutional linkages	• Create new city-wide partnerships • Build cross-scale institutional linkages at horizontal (across space —different neighborhoods) and vertical levels (across levels—different levels of government)	• Do the new partnerships encourage cooperation between the private and public sectors and different institutions, favoring the renewal of the management models of nearby neighborhoods?
6. Policy and Planning Integration • Adopt city-wide strategic planning • Promote functional linkages between different neighborhoods.	• Include the project in broad-scale strategies for urban development • Establish functional linkages between plans and projects, especially regarding neighboring neighborhoods.	• Is the project part of a larger development plan? • Do the interventions foster the development of regeneration strategies for surrounding areas?

Source: * Adapted from Hall, 1997; ** Elaborated by the author.

Answering these questions allows for the identification of the objectives foreseen by the project/program and the related impacts on the surroundings that positively or negatively influence the outcome of the project. In this regard, the analysis pointed out that OREs are not uniform but

depend both on the *Locational* and *Project/Program* characteristics, the combination of which produces uneven effects. The potential effects produced by these two factors are explained in the text below.

3.2.1. Locational Characteristics (L)

As an adage on real estate would have it, the three most important features in determining the price of a property are "location, location, location". Desirable locational characteristics – such as the accessibility to public transportation, services, stores, workplaces; the environmental values (e.g., air quality, water quality, land uses); and the quality of surrounding neighborhoods–are key factors in residential property values of the vicinity. In the same way, the proximity of deprived areas and neighborhoods depresses neighboring property values because it produces a decrease in demand and, consequently, in the market and rent prices [77–80]. The same negative impacts were also observed in the proximity of public housing developments by different authors see: [74,75]. On this, much research conducted through spatial statistics and spatial econometrics (e.g., price indices for zones and price gradient analyses) show that the distance is a significant parameter in the evaluation of locational externalities [74,81,82]. From this perspective, OREs are greater near the project area and decrease as we move away from it.

Moreover, each project can generate very different impacts from place to place, in relation to its features and degree of "reactivity" in an urban context; "every redevelopment project is unique in terms of its design and interaction with the neighboring environment" [78] (p. 170). Support for this thesis is shown by several studies reporting that neighborhood renewal can generate opposite effects in terms of raising surrounding property values [83–85], and, therefore, distance could be more or less a positive factor.

It follows that the impact of an investment cannot be measured without understanding its effects on the value of the neighboring land [82]. For example, as noted by Baumont [73], urban renewal promoted by public housing interventions may have direct positive impacts on surrounding properties. De Sousa et al. [83] have estimated the impacts of publicly assisted brownfield redevelopment, showing that the increase in nearby residential property values "is significant in both quantity and geographic scope, as redevelopment led to a net increase" of housing prices in nearby surroundings. Collins and Shester [86] show that the recovery and enhancement of the existing housing stock increase income and property value of surrounding areas.

From an opposite scenario, Newell [87] suggests that the overall increase in new housing supply produced by neighborhood renewal may cause economic losses on the values of homes near the development, especially if there is no growing demand for housing. In cases where the project aims to strengthen the housing supply for the lower middle class, "public housing projects allegedly increase congestion and noise, attract a majority of low-income families, thereby reinforcing the ill repute of the districts, and drive down housing values" [73] (p. 302). The attraction of further disadvantaged populations not only is likely to increase the stigma and the social exclusion of the residents but can also have negative effects on the prices of the neighboring areas. As noted by Gibbons [88], in fact, home-owners are willing to pay a substantial premium for good neighbors. By contrast, projects based on recovery and enhancement of housing stock risk to increase the rents to a disadvantage of the lower-income inhabitants, favoring gentrification processes [89–91].

Finally, another aspect that must be taken into consideration is the characteristics of the urban environment. Indeed, some studies show that impacts vary according to the classification of neighboring housing markets and the years of construction [92]. Reviewing a panel of high-rise developments in the city of Hong Kong, Chau and Wong [93] have demonstrated that urban renewal reduces the value of buildings located beyond the boundaries of the project, with greater effects for older buildings. As noted by Newell [87], new construction or renovation increases the aesthetic value of a structure and the nearby undeveloped homes are not perceived as desirable. As a result, both consumers and appraisers lower their value assessments of older homes.

3.2.2. Project/Program Characteristics (P)

From previous considerations, it follows that distance, understood as geographical proximity, cannot be the only parameter that may influence positive or negative externalities. Housing externalities, in fact, depend on spatial and functional linkages that are established between the housing project and the neighborhood environment. These interactions vary for every renewal intervention that can or cannot generate a positive spillover "through a responsive and beneficial integration of the new development with the existing neighborhood" [78] (p. 156). Therefore, the evaluation of the spatial and functional characteristics of the context represents a key factor for maximizing positive synergies and attaining an efficient distribution of economic and social activities in an urban environment. Because "larger sites can also accommodate more common facilities and allow more flexible design, uses, or configurations, the lack of positive synergies arising from the economies of scale that could have been generated with the surrounding areas weakens the development potential. If they are present, the marginal gains in nearby property values will increase with the size of the residential investment" [84] (p. 27).

Furthermore, the regeneration of a well-defined area would reduce the redevelopment option value of the surrounding areas because after an area-based renewal project has been approved, the chances of new interventions being carried out in the same area decrease and, consequently, so do the investments in the surroundings of the project area. The buildings outside the regeneration area, even in the event of a subsequent intervention, would not reach the maximum regeneration potential that could have resulted from synergistic development opportunities [93]. Therefore, the neighboring neighborhoods lose the opportunity to enjoy the synergies generated by the combination of different economies of scale, with the consequent decrease of their development potential.

In this respect, it is important to consider that the progress of a renewal project can determine people's expectations for reconstruction and the possibility of replacement by new housing, as well as for the surroundings, with economic impacts on the residential market. The large-scale construction of new neighborhoods or the rehabilitation projects, in fact, "can change the relative attractiveness of existing neighborhoods" [51] (p. 2115). The concept of the neighborhood as "externality space", proposed by Galster [94], allows for the clarification of an important aspect related to the Outwards Regeneration Effects. From the individual perspective of residents or owners of property, the externality space refers to the space in which changes to the environment result from the actions of others that are perceived to be elements capable of significantly altering the level of individual well-being (psychological and/or financial). This may cause behavioral responses (e.g., migration, sale of housing, etc.) which, in turn, cause new changes to neighborhoods over the long term [51]. In this regard, Davis and Whinston [95] use a Prisoner's Dilemma analysis to explain the behavior of small owners, which tend to overlook possible improvements of existing structures, waiting for easy profits induced by the project.

Despite their importance, these aspects are still scarcely investigated or duly taken into account when projects are implemented by local governments. To deal with such issues, there is a need to take an integrated approach, so as to put to system the current and potential resources of each neighborhood, with wider regeneration strategies in the city as a whole. This view, primarily turned towards the external built environment, allows for the improvement of the perception of urban capabilities at stake, promoting the concept of opportunity as a result of positive exchange between different urban areas. In this context, social and functional mixity is not an internal condition, but the result of a resource-sharing program, according to the idea of neighborhoods as collaborative platforms [52]. As Galster [96] (p. 19) notes, in fact, "for formulating and justifying a mixed housing policy on either efficiency or equity grounds, it is crucial to understand exactly what sort of neighborhood effect(s) is operating in neighborhoods". For example, the provision of new public spaces and services can create extra local value if they are designed "outwards", not only for the inhabitants of the project area but also for a wider range of people living in the city.

The analysis of the literature highlights the existence of multiple effects, sometimes diametrically opposite, that a regeneration intervention can cause on its urban context. Table 3 shows an example of

some of the OREs referring to the two main policy aspects—Housing and Spatial Scale—described in the text above.

Table 3. OREs: literature-based evidence of opposite effects, in reference to two of the six main policy aspects highlighted in Table 2: Housing Implementation and Policy and Planning Integration. Data reported in this table point out the positive and negative regeneration effects, in order to make the two-fold perspective more explicit and to underline the need for a thorough assessment of projects.

Policy Aspect	Outwards Regeneration Effects	
	Positive	**Negative**
2. Housing Implementation	*Housing price rise* ■ The income and property value of neighboring properties can rise (Collins & Shester, 2010; Baumont, 2009; Bourassa, Hoesli & Sun, 2004; Hwang & Kim, 2016; Kim et al., 2016)	*Home values depreciation* ■ Overall increase in new housing supply and consequent depreciation of home values near development, especially if there is no growing demand for housing (Newell, 2010) ■ Property value reduction of buildings located beyond the boundaries of the project, especially older buildings (Chau & Wong, 2014)
	Reputation amelioration ■ New dwellings of higher quality can raise the standing of the neighborhood and attract higher-income residents (Cumming & DiPasquale, 1999) ■ The arrival of new residents could curtail existing bad neighborhood effects by introducing "social mixity" and dissuade higher-income populations from moving out (Baumont, 2009)	*Gentrification process* ■ Increase in rents and taxes to damage the inhabitants of lower incomes and cause gentrification processes (Vigdor, 2010; Malpezzi, 1996) that risk triggering a chain effect in the surrounding areas, with an increase in rents and prices of houses in the adjacent neighborhoods (Atkinson, 2002; Shaw, 2000)
6. Policy and Planning Integration	*Raise expectations for future development* ■ The nearby housing prices can increase due to the increase in expectations for a possible regeneration in neighboring areas (Choi, 2019; Han & Lee, 2009) ■ Older apartments are rated positively by the real estate market for their reconstruction potential (Lee, 2004; Choi, 2007)	*Reduction regeneration option value* ■ Reduction of regeneration option value and the consequent lack of investment in the surrounding areas to project (Chau & Wong, 2014)

4. Conclusions and Further Developments

The findings of this research reveal a significant correlation between regeneration projects and the transformation of urban surroundings contextualize and highlight multiple factors that should be considered to optimize the management of decision-making processes and design choices. As highlighted by the literature review, current evaluation models are unable to consider these aspects, or they do so partially.

Trying to overcome these limits, the research shows that there is a low perception of the impacts of urban regeneration projects in their urban contexts, outside the perimeter of the project areas. In general, especially in the case of public housing neighborhoods, the project evaluation focuses on internal quality assessment of renewed areas. In this context, the analysis highlights two key issues, briefly summarized below.

(1) The effectiveness of the spatial representation of degradation and urban poverty (Section 2.1). The question we ask ourselves is whether a spatial representation of decay, which tries to limit urban deprivation processes within well-defined limits, can effectively represent the problems of a neighborhood, and therefore, suggest effective solutions. In particular, it highlights how public housing estates are subjected to targeted interventions that often neglect, or do not effectively address, structural causes of decay and poverty. This shows up in two paradoxes: (1) the socio-spatial paradox in which the delimitation of the problem areas leads to the construction of a dangerous "urban

topography of disrepute", reinforcing the locational discrimination of the neighborhood's inhabitants; (2) the political-economic paradox, which takes place in the ideal attempt to homogeneously distribute amenities and services between different neighborhoods of the city. The impossibility of having necessary economic resources for this purpose, and above all, the different economic, socio-cultural, and spatial characteristics that distinguish the various urban areas, make this objective unattainable.

(2) The efficacy of the Area-Based Initiatives (Section 2.2). Taking into account the issues so far described, this study proposes a critical analysis of the area-based initiatives, offering a sort of an "operational translation" of the spatially circumscribed concept of urban problems. The promotion of interventions aimed at specific problem areas, in fact, shows two main underlying issues that limit the effectiveness of actions launched at the local level. First, the selection of areas and the definition of intervention limits often prove to be uncertain because it is likely to be inconsistent with the effective distribution of poverty. In this way, there is a risk of excluding from funding several deprived areas, producing new spatial injustices. Second, the search for localized solutions, mainly aimed at remedying the internal problems of neighborhoods—in the absence of interventions aimed at identifying and correcting the structural causes of degradation—contributes to the spread of curative urbanism with short-lasting effects.

The analysis of these two issues, which are the basis of the research problem, suggests the importance of shifting attention from the effects produced within the project area to the external effects induced by regeneration interventions (OREs) (Section 3). In particular, the evaluation of these requires answering two questions:

(1) What are the surroundings' gains or losses from a nearby urban regeneration project?
(2) How much does the context influence the outcome of the project?

In order to operationalize this analysis approach, the six policy aspects identified as being of relevance for decision support by Peter Hall have been declined in a number of key actions, consistent with the outward-looking regeneration approach suggested by the author. Among these are the following:

- Improving sustainable mobility (public transport networks and cycle–pedestrian paths), networking services, and commerce activities in order to promote daily population movements across different neighborhoods. This means rationalizing resources, avoiding duplicating the existing offerings, and making sure that each neighborhood can provide specific services that are useful to the entire community.
- Expanding the housing offerings (rehabilitation of the existing housing stock and new housing development, especially infill construction) in order to create diversified offerings and to attract new residents, as well as to combat the gentrification phenomena. For this to happen, it is necessary to create a new housing offering according to the wider real estate market with the objective of ensuring a broader urban social mix.
- Increasing the supply of public spaces and services —especially green areas, goods, and social welfare services, as well as educational and cultural activities and jobs—in order to expand the diversity of available options and to encourage interaction among inhabitants of different neighborhoods.
- From the point of view of institutional arrangements and planning, urban regeneration projects should be delivered through broader partnership-based governance arrangements that place more emphasis on concerted action between different neighborhoods and institutions, in order to favor the renewal of the nearby urban areas and to define city-wide regeneration strategies.

Subsequently, these actions have been turned into a set of preliminary questions that allow the qualitative evaluation of corresponding OREs, in order to outline a comprehensive conceptual framework of analysis for regeneration projects and their induced effects. This framework is defined through a significant sample of research based on the case study methodology. This research evidence was used to substantiate the OREs selection.

The OREs analysis provides an alternative approach for assessing the success/failure factors in regeneration projects and allows a preliminary qualitative framework for the assessment of future projects. In both cases, this may have important implications in terms of urban policy because this can provide a forecast of the transformative impacts that a selected project can trigger in a wider urban context, in terms of environmental, economic, and social benefits/losses.

For this, planners and administrators should be concerned with OREs, especially in order to assess which interventions can guarantee the greatest benefits for the community. The aim of OREs analysis, in fact, is to construct a method for evaluating regeneration interventions according to equity and sustainability principles, in order to reduce one of the possible causes of the theory-practice gap [97].

The proposed research lays the ground for further theoretical exploration and empirical investigation of the subject. Further development of this research could lead to the definition of a comprehensive list of strategic and operational criteria. To that end, it will be necessary to define different qualitative and quantitative indicators, specifying the core assessment criteria for each question defined in the preliminary qualitative framework, and to select a number of relevant case studies in order to verify the effectiveness of the proposed indicators.

While this can seem straightforward at first, the implementation of the research findings into project practice requires great effort. One of the major problems, for example, is how to identify the data available in each city in order to build simple and generalizable methods for assessing OREs in different urban contexts.

This brings us to the most telling point. In order to have a great impact, the OREs evaluation will need to be introduced in ordinary planning practices. The question, therefore, becomes that of stimulating interest in this new perspective on the evaluation of regeneration projects, while improving the knowledge of project-induced impacts by the various factors involved in decision-making processes, in development planning, and in project design and implementation.

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Addressing Social Sustainability in Urban Regeneration Processes. An Application of the Social Multi-Criteria Evaluation

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Abstract: The concept of sustainability is widely seen as fundamental to set up urban and territorial transformations. Sustainable development is a multidimensional and multi-perspective process that deals with the environmental, economic, and social dimensions, with the aim to find a balance among these. Despite this growing attention to sustainability the social perspective has been the less explored of these dimensions and only recently it is receiving consideration due the Sustainable Development Goals (SDGs) that aim at creating sustainable and inclusive cities and communities. In the SDGs, specific attention is focused on the improvement of the quality of life of inhabitants through specific actions dedicated to the valorization of cultural resources, to the protection of the environment, and also to promote the involvement of the local communities in setting policies and programs. The final objective is defining projects based on the social needs shared by the communities. This paper aims at exploring the social sustainability related to urban regeneration processes with particular attention to social cohesion and community engagement. Six different urban regeneration strategies, developed for the regeneration of an urban area located in Northern Italy and based on social housing interventions, have been evaluated in accordance with their social impacts on the stakeholders involved. The paper proposes a multi-methodological approach based on the combination of the stakeholder analysis with the NAIADE (Novel Approach to Imprecise Assessment and Decision Environments) methodology, a particular type of Social Multi-Criteria Evaluation. The stakeholder analysis has been applied to identify the actors to involve in the evaluation, whereas the NAIADE methodology has been implemented for the selection of the most preferable strategy. This method allowed the assessment of the different strategies through the comparison and the mediation between the technical and the social rankings, thus considering the stakeholder preferences in the final evaluation. The final result is coherent with the initial purpose and it demonstrates that the inclusion of the stakeholder is fundamental for the achievement of a consensus solution.

Keywords: social sustainability; multi-criteria analysis; urban regeneration; stakeholder analysis; NAIADE method

1. Introduction

During this last decade, social sustainability has been recognized as a fundamental component of sustainable development. This increasing attention is also recognized in the European policies and in the Sustainable Development Goals (SDGs). In detail, the present paper is focused on the social issues that are examined in specific goals, such as (1) increasing wellbeing (SDG 3), (2) reducing inequalities (SDG 10), creating resilient, inclusive, and safe cities (SDG 11), and promoting peaceful and inclusive societies (SDG 16) [1–3].

However, it has been widely recognized that the different dimensions of sustainable development (e.g., social, economic, environmental, and institutional) are not being equally prioritized by policy-makers within the sustainability discourse [4]. In fact, despite the abundance of social studies and policy documents, researchers have rarely approached sustainable development including equity and community engagement in the process.

In the literature, there is a relatively limited number of studies that focus specifically on social sustainability within its assessment, despite its recently increasing importance in setting urban and territorial transformations [1,5]. What clearly emerged from an in-depth literature review is that the concept of social sustainability is underdeveloped and often simplified in the existing theoretical frameworks [1,6,7]. Instead, social sustainability is a multidimensional concept. It deals with several social issues, such as inequality, displacement, and poor quality of livability [8–10]. Nowadays, there is a theoretical debate about both the meaning and the definition to use for rigorously addressing social sustainability. In fact, this concept includes different issues that belong to the philosophical, political, and practical fields. Therefore, it is complicated to determine its boundaries and define precisely what social sustainability means [1]. During the last decade, different scholars have observed social sustainability from different perspectives [11,12]. Some authors discuss about social sustainability in relation to democracy and equity [7], whereas others highlight the relationship between urban development and social sustainability focusing on community participation and engagement [9], also exploring the social dimension of sustainability through social impacts of physical elements and urban transformation [10,13,14]. In this context, different social sustainability definitions have been developed, and as a consequence, a wide range of approaches and methods for its assessment have been proposed. As an example, [15] identified at least 27 sustainability assessment techniques that have recently emerged in the literature and which are distinguished by different theories. Based on these circumstances, a comprehensive definition of social sustainability with a special focus on urban environments, provided by [16], has been chosen for this application. The final aim of this definition was putting the urban sustainability debate in relation with the physical environment (e.g., housing, urban design, public spaces) and its transformation, to assess the social impacts on the community involved in the regeneration process [17].

Considering both the necessity of a cross-disciplinary approach to analyze and assess social sustainability and the absence of consensus on which method to apply [10,18,19], this paper proposes the application of an integrated method based on the Social Multi-Criteria Analysis [20]. In particular, the NAIADE (Novel Approach to Imprecise Assessment and Decision Environments) method has been applied to perform and combine the technical rank and the social evaluation to assess the best alternative, considering for the evaluation the social impacts on the stakeholders.

The paper is structured as follows: Section 2 describes and compares the main approaches used to assess social sustainability; Section 3 is focused on the description of the NAIADE methodology to summarize its main characteristics; Section 4 is related to the presentation of the real case study and to the illustration of the evaluation process; Section 5 includes some final remarks and the future perspective.

2. Social Sustainability Assessment

As mentioned in the previous part, no consensus has been recognized in defining social sustainability. Therefore, several methods have been developed and adapted from different fields to evaluate social sustainability. This section describes and compares five of the main methods collected in the literature within their general frameworks, as shown in Table 1.

2.1. Social Return on Investment (SROI)

The Social Return on Investment has become one of the most applied approaches for assessing social impacts [21,22]. The SROI methodology was developed in 1996 by REDF (Roberts Enterprise Development Fund). It aims at evaluating the changes that certain projects can produce, in terms of

social, environmental, and the economic outcomes in monetary terms [23,24]. The evaluation is based on the assumption that each investment should consider both the financial value and the generated benefits. The final aim of the SROI method is determining the social values that are generated by an activity or organization.

The implementation of the SROI method within the context of urban projects is very recent and it is grounded on the Cost Benefit Analysis (CBA), putting more attention on the identification of the stakeholders involved in the process than the CBA.

From the methodological point of view, the SROI evaluation can be processed following these six phases [25]:

(1) Establishing the scope and identifying the stakeholders;
(2) Mapping the outcomes;
(3) Demonstrating the outcomes and giving them specific value;
(4) Establishing impacts;
(5) Calculating the SROI and performing the sensitivity analysis;
(6) Reporting.

2.2. Social Impact Assessment (SIA)

The Social Impact Assessment (SIA) is built on the principles of the Environmental Impact Assessment (EIA) [26–29]. The SIA method is addressed for managing and analyzing the social issues that can occur during planned policies and actions [30]. Therefore, the SIA method is mainly focused on the identification of the consequences of the current or future actions. It has been introduced in the context of urban transformations in the 70s and, actually, SIA methods are used to assist decision making and prioritization of social investment by project proponents [31].

The general procedure to process the SIA evaluation can be summarized as follows: (1) creating a participatory process with the objective to facilitate community discussion about the future actions and their impacts; (2) gaining a good understanding of the communities and actors that are affected by the policy under examination; (3) identifying the real community needs; (4) scoping the key social issues; (5) collecting the baseline data; (6) forecasting the social changes that may result from the policy; (6) establishing the significance of the predicted changes and also determining how various groups and communities will respond; (7) examining the other options; (8) developing a monitoring plan [19].

Moreover, the identification of the stakeholders involved in the process is fundamental within the SIA implementation. In fact, the final aim of the SIA methodology is assessing the consequences of actions in terms of impacts on the actors involved [19].

Therefore, the most important characteristics of the SIA, that implies its implementation in urban planning plans, can be argued as follows:

(1) The final aim is the identification of the social impacts generated by an action on the community and on the citizens (the stakeholders involved);
(2) The results obtained by the SIA methodology are useful to support the decision making process of a transformation project, according to its social impacts;
(3) It is applied in the ex-ante phase, so it is suitable to evaluate in advance the social impacts, both positive and negative;
(4) It is able to increase the community consciousness about the intervention and its consequences.

2.3. Social Multi-Criteria Evaluation (SMCE)

The technique of the Social Multi-Criteria Evaluation (SMCE) has been developed by Munda with the aim of integrating the Multi-Criteria Analysis (MCA) with technical and social issues [20]. SMCE can be considered a specific typology of Multi-Criteria Analysis (MCA) that is focused on the social dimension of a problem. More in detail, SMCE is grounded on the principle of the necessity of

extending the MCA with the incorporation of the notion of the stakeholder. In fact, the stakeholder participation is used as the input of the analysis itself in the SMCE process [32]. Addressing the position and the role of the stakeholder is fundamental when dealing with complex systems in which the actors can have conflicting and legitimate opinions about the possible solutions of the problems. Based on these circumstances, the evaluation process related to this method has to be participative and transparent [20]. Furthermore, in SMCE, the participation is necessary but not sufficient [32] because the transparency plays a crucial role, allowing us to underline and express which are the values and which stakeholder groups are favored by each option.

Based on these characteristics, the SMCE aims at analyzing the decision making processes in complex and interdisciplinary perspectives, considering the plurality of objectives of different stakeholders involved.

The main principles on which the SMCE is grounded in can be summarized as follows:

(1) Definition of the problem;
(2) Institutional analysis;
(3) Generation of the policy options;
(4) Construction of the multi-criteria impact matrices;
(5) Application of the mathematical procedure;
(6) Sensitivity analysis.

2.4. Social Life Cycle Assessment (S-LCA)

The Social Life Cycle Assessment (S-LCA) is grounded on the Life Cycle Thinking (LCT) approach. In detail, it is one of the three techniques that compose the Life Cycle Sustainability Assessment (LCSA) [33–35], that allows the assessment of sustainability within its three different dimensions: (1) economy, (2) environment, and (3) society. Figure 1 illustrates the three different techniques that compose the Life Cycle Sustainability Assessment or rather: (1) Environmental Life Cycle Assessment (E-LCA), (2) Social Life Cycle Assessment (S-LCA), and (3) Life Cycle Costing (LCCA).

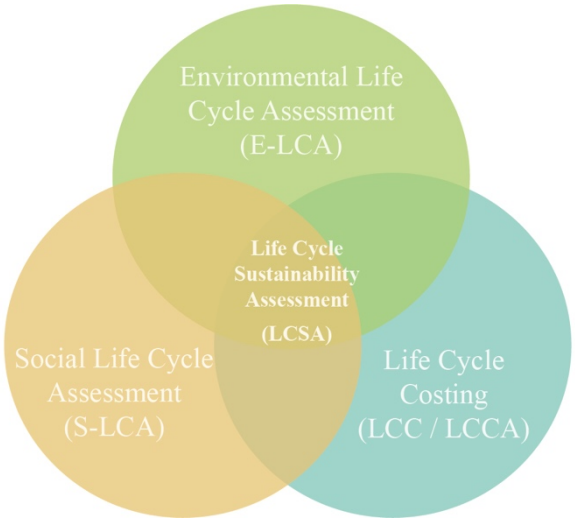

Figure 1. Life Cycle Sustainability Assessment (LCSA) (source: [36]).

Social Life Cycle Assessment (S-LCA) allows the evaluation of the social impacts of products and processes on the interested stakeholders. Its framework considers two categories: (1) stakeholder category and (2) impacts category [37,38]. Thus, it is possible to highlight the most significant social and socio-economic aspects within the life cycle of products/processes.

The evaluation is processed following these main steps:

(1) Definition of the evaluation objective. In detail, the aim of the S-LCA implementation is strictly related to the use of the product under examination.
(2) Inventory analysis. This phase concerns the collection of data and information, useful to develop the analysis. The inventory phase foresees the identification of the indicators to use for the evaluation of the impacts.
(3) Evaluation of the impacts. This phase is dedicated to the assessment of the product's impacts on the stakeholders identified.
(4) Results explanation. The last phase is dedicated to the interpretation of the obtained results, in order to develop a final report in which the involvement of the stakeholders is described.

2.5. Community Impact Evaluation (CIE)

The Community Impact Evaluation (CIE) is a multi-actor evaluation methodology. This method has been developed to respond to the weaknesses of the traditional evaluation methods, such as the Cost Benefit Analysis (CBA) [39]. The CIE aims at identifying the convenience of projects according to the social preferences expressed by the stakeholders involved [40]. Therefore, the implementation of the CIE methodology has become relevant to support the decision making in urban regeneration and transformation processes [40–42]. In detail, the CIE evaluation steps can be summarized as follows [42]:

(1) Characterization of the project. In the first phase, the project has to be described in-depth, providing also information of the context in which it will be located;
(2) Mapping the stakeholder. The second phase concerns the identification and the mapping of the social groups interested by the project. The mapping is based on their spatial location (on site or off site) and over time (in short and medium-long term). Moreover, as suggested by [43], the stakeholders have to be categorized into two macro-groups. The first group represents the active stakeholders, such as operators and producers. The second group illustrates passive actors, such as the consumers who use goods and services;
(3) Analysis. This phase is structured into two subsequent steps. The first one is defining the project's objectives, through which it will be evaluated in terms of impacts on stakeholders. The second step concerns the identification of the effects for the groups of interest;
(4) Descriptive assessment. In this phase, the impacts are evaluated both in a qualitative and quantitative way. Specifically, the final evaluation is performed through a final intersection grid that summarizes the social preferences of stakeholders with the impacts of the project.

2.6. Overview of Methods for Social Sustainability Assessment

Table 1 compares the five methodologies above illustrated, highlighting (1) the evaluation objective, (2) the derivation method, (3) the presence of the monetization of social benefits, (4) the typology of the evaluation, (5) the participation role, and (6) the application of the methods in urban or territorial fields.

Table 1. Comparison of the described methods (elaboration from [36]).

	Evaluation Objective	Derivation Method	Monetization of Social Benefits	Typology of Evaluation	Participation Role	Application in Urban or Territorial Field
SROI	Social impacts, and socio-economic impacts	[Social Balance BS + CBA]	Yes	Ex-ante Ex-post	Necessary	Urban regeneration policies [44]; Social Housing [24]; Rural development in England [45]
SIA	Social impacts, and socio-economic impacts	[EIA]	No	Ex-ante	Necessary	Land requisition [46]; Rebuilding a neighborhood [47]; urban regeneration [48]
SMCE	Social impacts	[MCA]	No	Ex-ante	Necessary, but not sufficient	Urban sustainability policies [49]; Windfarm location [50]
S-LCA	Social impacts	[LCA + LCC]	No	Ex-ante	Necessary	Not actually (the principle of Life Cycle Thinking is actually applied to evaluate a single sector of an urban system) [51]
CIE	Social impacts	[CBA]	No	Ex-ante	Necessary	Urban regeneration process [40]; Urban restoration [41]; Smart city [42]

3. Method

The present paper proposes the multi-methodological approach based on the combination of the stakeholder analysis with the NAIADE methodology to analyze six different urban regeneration strategies. This section aims at briefly describing these two techniques within their main characteristics.

3.1. Stakeholder Analysis

The Stakeholder Analysis (SA) is a technique used to define strategies through the identification of the key actors within their objectives and interests [52]. In detail, identifying and analyzing the interest of the different stakeholders is fundamental within urban regeneration processes [53,54]. Thus, it is possible to identify in advance possible conflicts among them and also to better recognize their needs and requirements [54]. From the practical point of view, stakeholders are classified according to their objectives and to the resources that they can carry out in the process (i.e., political, economic, legal, and cognitive resources) [52]. Therefore, it is possible to divide stakeholders into five categories, namely political, bureaucratic, special interest, general interest, and experts. Different methodologies can be applied to map stakeholders and actors, such as the Power/Interest Matrix [55], the Stakeholder Circle Methodology [56] and the Social Network Analysis [53,54,57].

In detail, in this paper, the Stakeholder Circle Methodology is applied to map the stakeholders involved (Section 5.1). This specific technique, developed by Bourne [56] analyzes and maps the stakeholders according to their proximity, power, and interest. Moreover, it permits in this application to list the stakeholders according to these three criteria to determine which are the key players in the process.

3.2. NAIADE Methodology

The NAIADE methodology (Novel Approach to Imprecise Assessment and Decision Environments) refers to the Multi-Criteria Analysis (MCA). It belongs to the Social Multi-Criteria Evaluation approach, developed by Munda [20,32,50,58] as a framework to apply social choice in complex political problems to focus on the stakeholders and their specific interests. Considering the peculiarities of the SMCE (Section 2.3), the NAIADE method has been widely applied in many different

fields, and also in urban and environmental contexts. Table 2 summarizes the main application of the NAIADE method in urban and environmental fields.

Table 2. Literature review on the NAIADE approach in the context of urban and territorial transformation projects (elaboration of [59]).

Author and Year	Decision Problem Context	Journal
Crescenzo et al., 2018 [60]	Urban planning	Green Energy and Technology
Nicolini and Pinto, 2013 [61]	Urban planning	Sustainability
Garmendia and Gamboa, 2012 [62]	Natural resource management	Ecological Economics
Monterroso et al., 2011 [63]	Ecosystem management	Journal of Environmental Management
Oikonomou et al., 2011 [64]	Protected area management	Environmental Management
Garmendia et al., 2010 [65]	Integrated coastal zone management	Ocean and Costal Management
Shmelev and Rodriguez-Labajos, 2009 [66]	Sustainability assessment	Ecological Economics
Ramírez et al., 2009 [67]	Environmental management	Energy Procedia
Gamboa, 2006 [68]	Environmental management	Ecological Economic
Munda, 2006 [58]	Sustainability assessment	International Journal of Environmental technology and management
Sturiale and Scuderi, 2019 [69]	Green infrastructure and climate change	Climate
Della Spina, 2019 [70]	Urban regeneration	Sustainability
Stanganelli et al., 2019 [71]	Urban regeneration	Sustainable cities and society

The peculiarity of the NAIADE method stands in the development of two different types of evaluations, that are:

(1) The technical evaluation. It is grounded on the score assigned to the criteria of each alternative and it is performed using an impact matrix (alternatives vs. criteria). In this case, the final output given by the NAIADE method is represented by the ranking of the alternatives, processed in accordance to the set of criteria preferences;
(2) The social evaluation that explores the conflicts among the different stakeholders. Furthermore, through this evaluation it is possible to explore the probable coalitions among different stakeholders using an equity matrix, which provides a linguistic evaluation of alternatives by each group.

Moreover, this methodology is structured to include both the qualitative and quantitative variables in the evaluation. The different typologies of variables that NAIADE is able to include can be summarized as follows:

(1) *Crips*, which values can be defined between only two different options;
(2) *Fuzzy*, that represent those variables defined as "uncertain" or "blur", for which infinite values can be assigned;
(3) *Stochastic* or rather "casual" because their values can vary continuously.

4. Case Study

The proposed multi-methodological approach is applied to evaluate six urban regeneration strategies, in accordance with their social impacts on the stakeholders involved. Specifically, these actions

have been developed for the regeneration program "Collegno Rigenera" for the city of Collegno (Northern Italy). This program has been promoted by the municipal administration and it is focused on the requalification of a specific area of the municipal territory that is characterized by economic and social fragility. The main challenge of this program is finding answers to the economic and social needs [72].

In the present case study, an integrated approach based on (1) stakeholder analysis and (2) the NAIADE methodology has been implemented to address the complexity of the decision problem under examination.

Urban Regeneration Strategies

As mentioned before, in this application the NAIADE method has been applied to evaluate the social impacts of six different regeneration strategies on the stakeholders involved in the process. The developed scenarios can be described as follows:

(1) Cultural District. This strategy aims at creating both social housing to respond to the necessity of the university students and at realizing cultural activities for the area, including a new library for residents and students;
(2) Smart City. The goal of this project is trying to give to the area a new identity. The major intervention is the creation of social housing blocks adapted to students, families, and the elderly;
(3) Start Up. This project is focused on the creation of social housing mixed with new activities, in order to improve both the social and the economic conditions of the area;
(4) City and Craft. This strategy is mainly focused on the valorization of the economic activities. In fact, in this project the realization of a new social housing block aims at revitalizing the area in order to attract also new economic activities;
(5) Sharing City. The main objective of this strategy is the creation of the common spaces to implement the community engagement and cohesion. Due to this, the social housing blocks foresee different common spaces;
(6) Green Infrastructure. This strategy aims at integrating new constructions with green spaces. In fact, the new housing blocks are connected with each other through green corridors and pedestrian paths.

5. Application

5.1. Stakeholders Involved in the Process

Before applying the NAIADE methodology, the stakeholders analysis has been performed to identify the stakeholders influenced by the urban regeneration process and to determine their objectives, interests, and resources. As mentioned before, this paper applies the Stakeholder Circle Methodology because it is able both to analyze and to map the actors involved, focusing on their power, and their proximity and urgency in the process, starting from their characteristics [52].

Table 3 surveys the stakeholders involved in the transformation process, with a specific reference to the level, the type, the resources, and the goal that they follow within the process.

Table 3. Survey of the stakeholders involved in the process (source: [36]).

Stakeholder	Level	Category	Resources	Objective
European Union	European	Political	Political	Political consensus
Piedmont Region	Regional	Political	Political	Improvement of the condition of the regional territory and political consensus
Metropolitan city of Turin	Local	Political	Political	Creation of the network between the different municipalities
Collegno Municipality	Local	Political	Political	Improvement of the social, economic, and urban conditions through the implementation of the regeneration process
Municipality technical office	Local	Bureaucratic	Legal	Improvement and protection of the municipal territory
Developer	Local	Special interest	Economic	Maximize the economic income
Business owners	Local	Special interest	Economic	Improving the condition of the area in which their activities are located to increase their economic incomes
Land owners	Local	Special interest	Economic	Maximize their economic income related to the increasing of the value of their properties
Sponsors	Regional	Special interest	Economic	Improving their visibility through the participation at the urban regeneration program
Associations	Local	General interest	Cognitive	Achievement of the social wellbeing and protection of the environmental and historic capital
Residents	Local	Special interest	Cognitive	Improvement of both residential and employment conditions in order to get better community cohesion
Students	Local	Specific interest	Cognitive	Increasing the studying services
Tourists	Local	Specific interest	Cognitive	Having new cultural attractions
Planners	Local	Experts	Cognitive	Economic income
Technicians	Local	Experts	Cognitive	Economic income
Media	Local	General interest	Cognitive	Exchange about territory information
Transportation Society (GTT)	Regional	Specific interest	Cognitive	Improvement of the transportation service
Artisans	Local	Specific interest	Cognitive	Improvement of the connection of this area with the other municipalities to increase the commercial opportunities

Figure 2 illustrates the result of stakeholder analysis performed through the Circle Methodology. As shown in Figure 2, stakeholders have been mapped considering (1) their power, that is represented by the dimension of the wedge they occupy, (2) their proximity, that is figured out by the concentric circles, and (3) their urgency, that is illustrated by the depth of the wedge. Through this analysis it was possible to determine the role and the position of different stakeholders in reference to the urban regeneration process. In detail, the developer, the technical office, and the municipality of Collegno can be considered key players within the urban regeneration process. Therefore, their power and proximity are relevant, and their urgency can reach the goal. Instead, land and building owners, business owners, inhabitants, planners, and technicians have medium power and high proximity and urgency. Thus,

the analysis has been fundamental to clarify the most relevant stakeholders to include in the social evaluation performed with the NAIADE method.

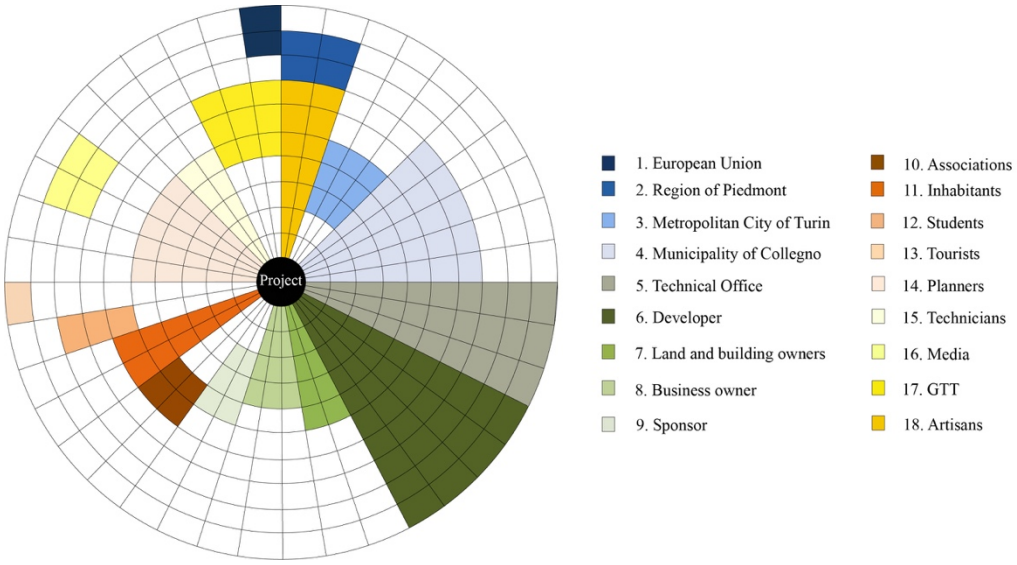

Figure 2. Stakeholder circle analysis (source: [36]).

5.2. Development of the NAIADE Methodology

5.2.1. Identification of the Criteria

The first step for the application of the NAIADE methodology concerned the identification of the criteria to use to evaluate the performance of each alternative. Table 4 lists the criteria considered in this application that are divided into five categories, namely, (1) sharing, (2) environment, (3) service, (4) mobility and accessibility, (5) economy, and (6) regeneration. In detail, these criteria have been selected during a focus group with experts and stakeholders [72]. Thus, it was possible to recognize their interests and objectives in the evaluation.

Table 4. List of criteria used for the evaluation [72].

Criteria Category	n.	Criterion	Unit	Description
Sharing	1	Public space/private space	[-]	Ratio between public and private surfaces
	2	Co-working space	[m^2]	Surface of the structures for workshops, meetings, and training courses
	3	Co-housing inhabitants	[num.]	Number of residents in new co-housing buildings
Environment	4	Permeable surf./Territorial surf.	[-]	Ratio between permeable areas and overall territorial surface of the program
	5	Urban gardens	[m^2]	Total area used for community and private urban gardens
	6	Waste production	[kg/year]	Amount of waste produced in a year by the activities of the program

Table 4. *Cont.*

Criteria Category	n.	Criterion	Unit	Description
Services	7	Residence	[m^2]	Surface for residential functions
	8	Commercial areas	[m^2]	Surface for commercial functions
	9	Sports and cultural areas	[m^2]	Surface for sport and cultural activities
	10	Mixité index	[0–1]	Index that describes the functional mix of the area
Mobility/Accessibility	11	Slow mobility	[m^2]	Surface of the pedestrian tracks and bicycle lanes
	12	Car parking	[num.]	Number of new public parking lots
	13	Bike or car sharing points	[num.]	Number of car and bike sharing points
Economy	14	Total Economic Value	[€]	Estimate of the social benefits delivered by the program
	15	Investment cost	[€]	Total cost of the program
	16	New jobs	[num.]	Number of new jobs created
Regeneration	17	Regeneration	[m^2]	Regenerated surface
	18	Via De Amicis regeneration	[qualitative scale]	Qualitative index showing the level of the regeneration of Via De Amicis
	19	Territorial Index	[-]	Ratio between the maximum buildable volume and the territorial surface

5.2.2. Technical Evaluation: Impact Matrix

Once the criteria to use were identified, the first step of the application of the NAIADE methodology was the development of the impact matrix (Appendix A). It evaluates the different scenarios according to the set of multidimensional criteria (both qualitative and quantitative) that includes all the relevant aspects of the decision problem. From this evaluation, a first technical ranking has been obtained, as shown in Figure 3.

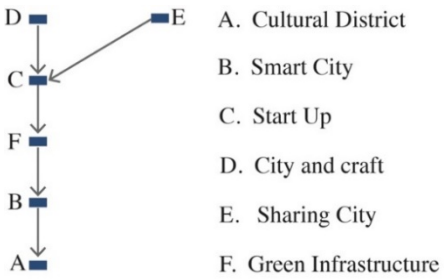

Figure 3. Technical ranking.

Resulting from the technical ranking, the two most preferred solutions are Scenario D, City and Craft, and Scenario E, Sharing City. In fact, these two scenarios have good performances (Appendix A) in the majority of the considered evaluation criteria. As an example, both scenarios have a very good performance in the criterion "total economic value" that has been applied to monetize the social benefits of the interventions. Moreover, Scenario D, City and Craft, gives great importance to the

criterion "urban gardens" that is considered fundamental by the stakeholders involved. Whereas the Sharing City scenario assigns a great relevance to the criterion "sport and cultural area" that is one of the main points of the "Collegno Rigenera", in order to make this area inclusive.

5.2.3. Social Evaluation: Equity Matrix

According to the NAIADE approach, a second matrix has been defined that is the equity matrix, as shown in Table 5. This matrix illustrates the assessment of each scenario, expressed in a qualitative scale by each stakeholder involved in the evaluation. Differently from the impact matrix, in the equity matrix stakeholders are allowed to evaluate each alternative using linguistic variables. In detail, the evaluation is processed by the analyst that examines the stakeholders' opinions, combining also the stakeholder analysis. Specifically, in this application, a multi-level scale has been considered to implement this matrix. Following the NAIADE methodology [20], the considered scale is composed of nine qualitative points that are (1) perfect, (2) very good, (3) good, (4) more or less good, (5) moderate, (6) more or less bad, (7) bad, (8) very bad, and (9) extremely bad. From this matrix, it is possible to examine the distributional issues. Specifically, using a distance function d_{ij} as a conflict indicator, a similarity matrix $s_{ij} = 1/(1 + d_{ij})$ can be constructed for all possible pairs of groups, so that a clustering procedure is meaningful. By applying this procedure to the social impact matrix, a coalition dendrogram can be obtained, as shown in Figure 4.

Table 5. Social impact matrix.

	Alternatives					
	Cultural District	**Smart City**	**Start Up**	**City and Craft**	**Sharing City**	**Green Infrastructure**
Developer G1	Moderate	More or less bad	Very Good	More or less bad	Very bad	Moderate
Municipality G2	Good	More or less bad	More or less good	Good	Good	Very good
Technical Office G3	Good	Moderate	Moderate	Good	More or less good	More or less bad
Planners G4	More or less good	Moderate	Moderate	Good	More or less good	Moderate
Artisans G5	Good	Good	Very Good	Perfect	More or less good	More or less good
Land and Building Owners G6	More or less good	More or less bad	Moderate	Moderate	Good	Very good
Inhabitants G7	More or less good	More or less bad	Moderate	Moderate	Good	Very good
Business Owners G8	Moderate	Very good	Perfect	Good	Good	More or less good

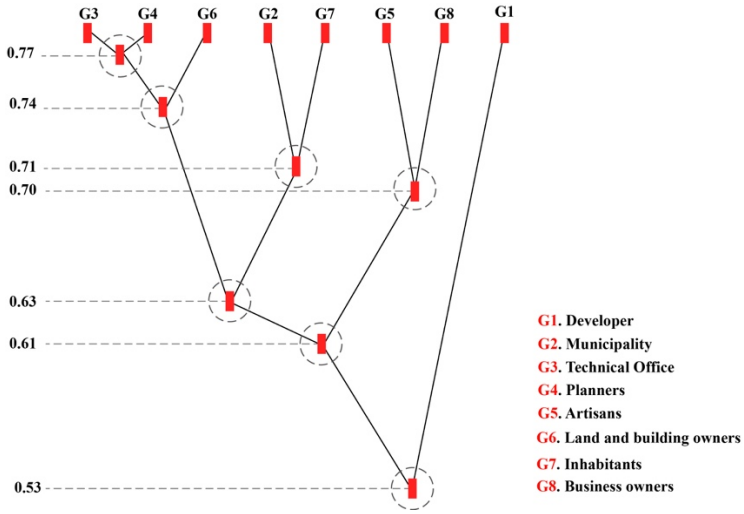

Figure 4. Dendrogram of coalitions.

6. Discussion of the Results

Figure 4 shows the dendrogram, through which it is possible to visualize the proximity of the stakeholders involved. The first coalition is built by the Technical Office (G3) and Planners (G4), and their proximity is very high (0.77) because both pursue the objective of the requalification of the area. Secondly, the abovementioned coalition is joined by Land and Business owners (G6), with a very high credibility (0.74). This can be justified by the fact that these three stakeholders aim at reaching the development and the improvement of the transformation area. Another coalition with a great credibility (0.71) is performed by the Municipality (G2) and Inhabitants (G7). In fact, both the stakeholders aim at improving the social and economic condition of this area. Thirdly, also the coalition between Artisans (G5) and Business owners (G8) has a great proximity (0.70). This is due to the fact that both Artisans and Business owners can have economic benefits from the improvement of the social conditions of the area. Moreover, some other coalitions with medium proximity have been identified. The first one, with the proximity of 0.63, is shaped by the joint between Technical Office (G3), Planners (G4), and Land and Buildings owners (G6), with Municipality (G2) and Inhabitants (G7). The second, with 0.61 of credibility, is the result of the joint between the abovementioned coalition (G3 + G4 + G6 + G2 + G7) with Artisans (G5) and Business owners (G8). The last coalition with medium-low proximity (0.53) is shaped by the combination of a coalition (G3 + G4 + G6 + G2 + G7 + G5) with the Developer (G1). This is interesting because it allows us to underline that the Developer has a very different objective from the other stakeholders. It was also possible to underline their interest in the economic return of the investment [73].

As suggested by [50], it is also important to combine the analysis of the social impact matrix (Table 5) with the dendrogram to give a robust interpretation of the obtained results to the decision makers. In this sense, it is possible to highlight that for the Technical Office (G3) and Planners (G4), the best solution is the alternative City and Craft, followed by the alternative Cultural District. Instead, for the Land Owners (G6), the preferred alternatives are the Sharing City and Green Infrastructure; however, also the scenario City and Craft is moderately good. Considering the coalition (G3, G4, and G6), the preferred solutions are the scenarios Cultural District and City and Craft. The Municipality (G2) and the Inhabitants (G7) are in accordance in considering the Smart City scenario as the worst alternative, whereas they consider good/more or less good the scenarios City and Craft, Sharing City, and Green Infrastructure. Finally, Business Owners (G8) and Artisans (G5) agree in appreciating the scenario City and Craft. Whereas the Developer (G1) prefers the Start Up scenario.

Considering that the main aim of this evaluation was assessing the different regeneration strategies considering both their social impacts and their technical performance, this application develops a

comparison and mediation between these, obtaining a multi-ranking evaluation. Figure 5 illustrates the comparison. In detail, the social ranking has been performed considering both the social impact matrix, that is shown in Table 5, and the dendrogram (Figure 4). Thus, it was possible to interpret and visualize the ranking of the alternatives according to the preferences expressed by the involved stakeholders. From the technical rank, the best performing scenarios are "City and Craft" and "Sharing City", as shown in Figure 5, while from the social point of view, the preferable strategy seems to be the "City and Craft" scenario. According to the results of the evaluation, the preferable scenario is "City and Craft", because it can combine both the technical and the social performances in order to maximize both the technical and the social impacts.

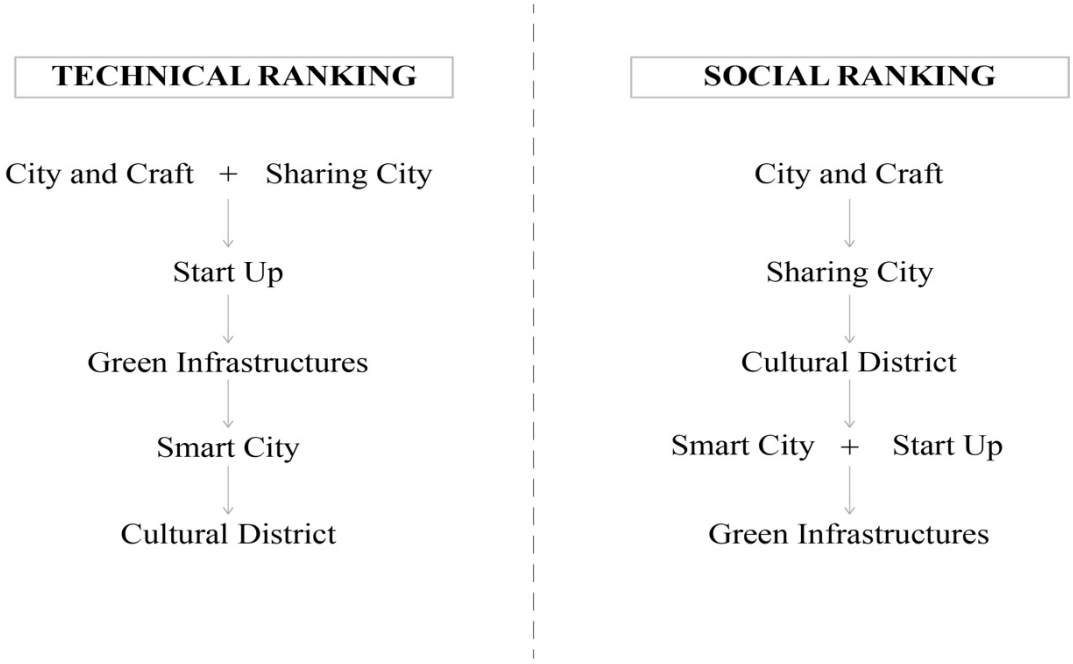

Figure 5. Comparison between technical and social ranking.

7. Conclusions

The present research proposes an investigation of the evaluation methods for addressing social sustainability within urban regeneration processes. In particular, the study illustrates the application of the NAIADE method combined with the stakeholder analysis for assessing different urban regeneration strategies, according to their social impacts on the stakeholders involved. In this decision process, characterized by a high level of complexity and different legitimate values and objectives, this method allowed the consideration of both the technical criteria and the opinions of the stakeholders involved [52,54]. This application highlights the importance of the involvement of the stakeholders within the evaluation process. Thus, it was possible to determine to which social impacts the stakeholders are exposed. Furthermore, it also underlines that the participation of the stakeholders is a necessary requirement to obtain social sustainability and to promote a consensus solution in the urban regeneration process [74–77]. Moreover, the results obtained by the social evaluation processed with NAIADE are comparable with the results obtained with other evaluation methods [72]. In fact, in these different evaluations, the most preferable scenario is the Sharing City. Thus, it can be demonstrated that also the social evaluation is fundamental in supporting urban decision processes, giving robust recommendations.

The main strength of using the NAIADE method for our purpose is represented by the social impact matrix and coalition dendrogram. In fact, in the equity matrix, the alternatives have been evaluated considering the social impacts on the same stakeholder, while the dendrogram shows the

coalition from a social point of view. The results obtained are highly coherent and the approach has proven strength. Furthermore, this application also demonstrates the suitability of using the NAIADE method to assess social sustainability, focusing on its relationships with the urban environment and its transformation [49,50,62], The application presented in the paper has allowed us to underline also the weaknesses of this method, or rather the method through which the social matrix and the comparison of rankings are performed. For this reason, future research and applications can be addressed to find a method to perform the social matrix and the implementation of the combination of the two different rankings in a more rigorous way, since it is actually performed in a qualitative way. Finally, further development could also consider the performing of a specific sensitivity analysis to better verify the model with the perspective to formulate more robust recommendations.

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Appendix A

Table A1. Impact matrix (elaboration from Bottero et al., 2017).

				Scenarios					
Criteria Category	**n.**	**Criterion**	**Units**	**Cultural District**	**Smart City**	**Start Up**	**City and Craft**	**Sharing City**	**Green Infrastructure**
Sharing	1	Public space/private space	[-]	4.31	3.25	1.33	8.35	2.76	4.20
	2	Co-working space	[m^2]	20,425	24,260	49,880	11,328	5108	3300
	3	Co-housing inhabitants	[num.]	398	150	255	421	2513	1036
Environment	4	Permeable surf./Territorial surf.	[-]	0.69	0.39	0.58	0.52	0.53	0.71
	5	Urban gardens	[m^2]	8527	2130	25,569	66,894	23,118	12,888
	6	Waste production	[kg/year]	1,350,845	2,332,234	2,692,663	1,817,205	3,014,301	1,631,941
Services	7	Residence	[m^2]	70,880	117,736	82,330	164,925	538,018	75,252
	8	Commercial areas	[m^2]	28,031	59,169	95,000	84,248	40,192	25,515
	9	Sports and cultural areas	[m^2]	48,150	81,796	26,960	21,458	114,725	37,920
	10	Mixitè index	[0–1]	0.71	0.46	1	0.30	0.30	0.64
Mobility/Accessibility	11	Slow mobility	[m^2]	68,326	171,609	16,000	132,541	624,933	251,831
	12	Car parking	[num.]	1385	2567	2100	1137	1689	1394
	13	Bike or car sharing points	[num.]	7	12	2	3	14	19
Economy	14	Total Economic Value	[€]	2,550,746	537,692	3,500,000	7,471,328	7,707,778	531,155
	15	Investment cost	[€]	233,336,184	279,468,021	100,000,000	183,948,594	494,055,026	231,527,860
	16	New jobs	[num.]	1010	1545	300	736	3229	768
Regeneration	17	Requalification index	[-]	0.20	0.12	0.51	0.36	0.06	0.20
	18	Via De Amicis Requalification	[qualitative]	Fair	Excellent	Good	Good	Very good	Very good
	19	Territorial Index	[m^2]	0.38	0.16	0.23	0.52	0.40	0.13

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MDPI

Review

Can Malaysia's National Affordable Housing Policy Guarantee Housing Affordability of Low-Income Households?

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Abstract: Housing affordability is a long-held issue in Malaysia, and housing policies have been implemented for low-income households over the years. However, there is a contradiction that housing affordability of low-income households has not been met, while the bulk of affordable housing is still vacant. In 2019, Malaysia enacted the *National Affordable Housing Policy (DRMM)* which was intended to improve housing affordability for low-income groups. This paper aims to answer why Malaysia's long-term implementation of affordable housing policies cannot guarantee housing affordability, and whether the *DRMM* can effectively improve housing affordability as expected, by comparing the empirical factors of housing affordability. A literature review and a comparative analysis are adopted in the research. The paper concludes that low household income, high land price, construction cost and compliance cost, mismatch of supply and demand in terms of quantity, the instability of the national economy, low home financing ability, and incomprehensive housing planning have caused low housing affordability of low-income groups in Malaysia. The *DRMM* as anticipated can improve housing affordability by supplying affordable housing more precisely, lowering housing costs, and improving home financing ability. However, the exclusion of household income and economic factors may cause the ineffectiveness of the *DRMM* in improving housing affordability for low-income households.

Keywords: housing affordability; housing policy; affordable housing; Malaysia

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1. Introduction

In 2019, Malaysia can be defined as a developing country comprised of 32.6 million people, 7.3 million households, and a total supply of 6.02 million homes, with its average household size decreasing to 3.9 persons from 4.1 persons in 2016 [1]. Shrinking household size, population growth, and urban migration have created an increasing demand for affordable housing. According to UN-Habitat [2], affordable housing is broadly defined as housing which is adequate in quality, location, and pricing that can sustain other basic living expenses. The term "affordable housing" is also often used to describe a housing unit that is affordable for those whose income is lower than the median household income in a place. The term "housing affordability" is often used to determine whether housing is affordable for households. There are three approaches commonly used to measure housing affordability, namely Median Multiple, Housing Cost Burden, and Residual Income [3]. In Malaysia, the Median Multiple method is used to evaluate the housing market and housing is considered affordable when the median price for the housing market is not more than three times the annual median household gross income [3–5]. Based on the 2019 Household Income and Basic Amenities survey [6], the Malaysian annual median household gross income was MYR 70,476; thus, affordable housing should have a market median price of MYR 211,428. As household income levels reveal a variance among states, the price of affordable housing is in two ranges; either less than MYR 150,000 or between MYR 150,001–MYR 300,000 [7]. In this paper, affordable housing refers to a housing with a selling price that does not exceed MYR 300,000.

Over the years, long-term affordable housing policies for the low-income groups have been implemented in Malaysia. However, based on a report from Khazanah Research Institute [4], Malaysian housing affordability has not improved significantly between 2002 and 2016. Over this period, housing was considered "seriously unaffordable" with the median multiple varying between four and five. In 2019, the average price for a Malaysian home, as measured by the Malaysian House Price Index, was MYR 426,155, while the average per capita income was MYR 45,034. According to the research issued by *The Edge Malaysia* [1], within a timeframe of almost 30 years from 1990 to 2019, the average housing prices have increased 5.6 times while the real income measured by GDP per capita has only grown 2.8 times. It means that the growth in housing prices has surpassed real income by two times since 1990.

The National Property Information Centre (NAPIC) [8] showed that 30,664 units of new residential property were unsold in 2019, among which 32.4% was affordable housing. This reflects the contradiction that whilst the housing affordability of low-income households cannot be met, the bulk of affordable housing is still vacant. In 2019, Malaysia enacted the *National Affordable Housing Policy (DRMM)* which was intended to solve this contradiction and to improve the housing affordability for low-income groups to own a house. In such circumstances, this paper attempts to find the reasons why low-income households have low housing affordability and whether the *DRMM* can guarantee housing affordability of low-income groups.

Drawing on a series of studies that have been completed, there are few that have reviewed the evolution of Malaysia's affordable housing policy to deal with the issue of housing affordability. Shuid [9] divided the evolution of Malaysia housing provision system from 1971 to 2011 into four phases to analyse the key players in housing provision. Masram and Misnan [10] used the housing provision framework to analyse the key affordable housing policies of Malaysia. There are even fewer that have evaluated the effect of the long-term policy implementation to address housing affordability. International experiences have proved that housing affordability can be solved by increasing the quantity of affordable housing and lowering housing costs. Malaysia has implemented both strategies, but the housing affordability issue has never been solved. This real scenario is that whilst housing affordability of low-income groups is not achieved, the majority of affordable housing supplied for low-income households remains unsold. What caused this scenario to happen in Malaysia is an interesting question to ask and the answer to this question will be an academic contribution that can help to enhance the strategy to improve the housing affordability issue effectively. Moreover, up to now, no researcher has attempted to explore whether the *DRMM* could guarantee the housing affordability of low-income groups. This is the first study that draws attention to *DRMM* strategies in improving the housing affordability of low-income groups. The findings have important implications for the revising of the *DRMM* strategies to improve the housing affordability of low-income groups. The results will also influence future housing policies in Malaysia.

This paper begins with the definition of housing affordability and its influencing factors based on the international literature. Then, the paper subsequently reviews the evolution of Malaysia's affordable housing policy since its independence in 1957, analyses the reasons for the low housing affordability of low-income households in Malaysia and evaluates the effectiveness of the strategies proposed in the *DRMM* by comparing them with the influencing factors of housing affordability. Lastly, the paper concludes with a discussion on the results of analysis and evaluation, as well as the suggestions for revising the *DRMM* strategies and drafting future housing policies to improve the housing affordability of low-income groups.

2. Housing Affordability and Its Influencing Factors

Housing affordability is a global issue which many countries have attempted to overcome. It is not an inherent attribute of a housing unit, but rather a relationship between housing and people [11], depending on one's ability to pay for a housing unit. Housing

affordability is often related to "affordable housing" for low-income groups, but it is a problem regardless of whether people are rich or poor. As mentioned earlier, the Median Multiple method is used to assess the Malaysian housing market. Based on the concept, in this paper housing affordability is defined as the ability of Malaysian low-income households (B40) to own a house, with the housing price-to-income ratio not exceeding three. Low-income households include poor households with a monthly income of less than the poverty line income (PLI). The analysis of housing affordability in this paper is limited to home buyers due to the insufficient data on rental housing.

A deep understanding of the influencing factors of housing affordability is crucial to determine the reasons for low housing affordability. The international literature indicates that housing affordability is generally affected by four dimensions, i.e., household income, housing price, home financing ability, and housing planning. However, there are many factors that impact housing prices [12]. According to Mostafa [13], housing prices vary along with the changes in regional economics. The development cost which consists of land cost, hard costs (construction costs), and soft costs (consultant fees and processing costs) can also alter housing prices [14]. Meanwhile, housing obtains its price due to the factors surrounding supply and demand, which can be proved in the cases of the US [15] and Australia [16]. In those countries, the disparity between housing supply and demand has led to either an increase or decrease in housing prices. Thus, the influencing factors of housing prices are interpreted in this paper in terms of land cost, construction cost, compliance cost, supply and demand, and economic factors. Based on international experience, the following eight factors are identified as the most significant in view of their influences on Malaysia's housing affordability.

2.1. Household Income

Low household income is recognised by many countries/regions as the key factor of the shelter–cost burden, such as in the UK [17], mainland China [18], Hong Kong China [13], Canada [12], Australia [19], Kenya [20], and Nigeria [21], which can significantly influence housing affordability from the perspective of housing accessibility and purchasing power [22]. Housing affordability suffers when housing prices go too much ahead of household income [15,23]. This can be further supported by Duan [18] who argued that household income impacts housing demand because it is a benchmark for one's purchasing power that could affect an individual's ability to obtain a mortgage loan.

2.2. Land Cost

Limited space and scarce land resources cause high land prices which are ultimately reflected in housing prices [24]. According to the *New Straits Times* [25] and the *Daily Express* [26], land scarcity is a key influential factor affecting the increase in housing prices, especially in the urban areas of big cities such as Kuala Lumpur. Meanwhile, the increase in land prices is a major factor that influences housing affordability. The conversion of land into residential use incurs a land cost [23], which consequently burdens home buyers. That is the reason why the UN-HABITAT [2] outlines the total land cost as one of the factors affecting housing affordability.

2.3. Construction Cost

Construction costs, such as infrastructure, building materials, and labour are also known as hard costs in total housing development costs. A household's ability to purchase a home becomes worse when the construction costs and housing prices become higher [2,14,16,19,26].

2.4. Compliance Cost

Compliance cost is incurred from the payment of land conversion, processing fees, and statutory contribution charges to utility companies. When compliance costs from local regulations are involved, housing development becomes riskier, longer, and more

expensive, which in turn impacts housing affordability [27]. For example, in the U.S., the Dept. of HUD uses the compliance cost that is associated with effluent regulation to measure the change in housing affordability [28].

2.5. Relation between Supply and Demand in Terms of Quantity

It is widely believed that housing affordability can reflect housing market conditions [29,30]. The housing affordability issue may become urgent as the demand for affordable housing continues unabated and can be further intensified by an inadequate supply of affordable housing [16,24]. The failure of housing supply to meet with a proportionate demand along with population growth may raise the pressure on housing prices and housing affordability [15]. According to Yap and Ng [23], the residential real estate market in high population density cities is always active with routine transactions, thus housing prices are increased, which influences housing affordability.

2.6. Situation of National Economy

Economic changes could impact construction costs and inflate housing prices, as housing prices depend on the economic conditions including either inflation or deflation [31]. In the case study of Hong Kong, a regression analysis over time was taken to evaluate the impact of economic factors on the housing affordability of low-income households in terms of GDP, the inflation rate, and the unemployment rate [13]. The result showed that economic growth did not significantly affect the housing affordability of low-income groups while inflation and unemployment rates negatively did. Worthington and Higgs (2013) also found that economic growth is a short-term issue for housing affordability while the taxation imposed on housing will affect housing affordability in the long run.

2.7. Capability of Home Financing

A good financial plan is needed for home buyers to achieve long-term affordable homeownership. Finance for housing is a fundamental factor used in determining housing affordability [16,32] which is represented by two financing abilities, i.e., the ability of financing for purchase through a down payment and the ability of a financial service to pay the housing loan and interest rates after cutting non-housing expenditure [2]. A tight lending environment further exacerbates the issue of securing home financing from private banks [23]. In general, saving capacity [19,29], household expenditure [21,33], and monthly instalments [20,33,34] are the basic financial costs that influence housing affordability.

2.8. Housing Planning Justified by Data Analysis

International experience has showed that a scientific and reasonable housing plan based on housing market analysis is essential for affordable housing delivery and housing affordability [16]. Insufficient analysis on household data in housing plans often causes an inaccurate estimation of market demand and discrepancy in views between households and developers. Consequently, product mismatch [4] will appear which may lead to the rise of vacant affordable houses that cannot meet expectations and cannot benefit the people [34]. In other words, many people would not find suitable and affordable housing where developers fail to provide the right types of properties at the right location [35].

3. Policy Initiatives of Malaysia's Affordable Housing Development

In Malaysia, before the *National Housing Policy* was issued in 2012, housing policy evolved through the country's five-year development plans. Low-cost housing was considered as affordable housing when it was subsidised and was allocated only to low-income people with several eligibilities set by the government [36]. This section reviews the evolution of Malaysia's affordable housing policy from 1957 in chronological order. Table 1 shows the government's initiatives of affordable housing development with different policies in different periods.

Table 1. Policy initiatives of Malaysian government in affordable housing development since 1957.

Phase	Backgrounds and Challenges	Initiatives of Government		Implementation Effects
		Name of Policy	Strategies	
1957–1970	Rural–urban migration, squatter and overcrowding problems	*First Development Plan for Malaya and Secondary Five-Year Plan (1956–1965)*	- Improve basic infrastructure and rural development - Focus more on benefit of civil servants	- 23,236 government quarters and 8938 low-cost housings constructed - Shortage of low-cost housing
		First Malaysia Plan (1966–1970)	- Housing Crash Programme - Laws enacted for squatter clearance	- 21,790 low-cost housing constructed, 73% of the target
1971–1985	Tragedy of 13th May 1969, *New Economic Policy* (*NEP*) was established	*Second Malaysian Plan (1971–1975)*	- Housing programs carried out in line with *NEP* objectives - Low-cost housing built by state governments with subsidised Federal loans - Core Housing concept	- 13,244 units completed, 50.5% of the target
		Third Malaysian Plan (1976–1980)	- Control on housing costs - Provision of funds - Housing loan repayment period extended from 20 years to 25 years	- 26,000 units completed, 35% of the target
		Fourth Malaysian Plan (1981–1985)	- Low-cost Housing concept - 30–50% of private housing projects for low-cost housing at maximum MYR 25,000 per unit	- Public sector: 71,310 units completed, 40.4% of the target - Private sector: 19,170 units completed, 21.9% of the target
1986–1997	Economy depression from 1986 to 1987	*Fifth Malaysia Plan (1986–1990)*	- Promote open market policy - Reduction in public housing development budget - Establishment of one stop agency - Establishment of Recovery Fund for Abandoned Housing Project in 1990	- Private sector: 88,880 units completed, 24% of the target - Public sector: 74,330 units completed, 61% of the target - Housing Scheme: Special low-cost Housing Program
	To provide adequate housing and ensure houses built are accessible and affordable for all citizens, especially low income group	*Sixth Malaysia Plan (1991–1995)*	- Implementation of the concept of Human Settlement - Implementation of cross-subsidies method - Establishment of Low-cost Housing Fund in 1993, Housing Foundation for the Poorest People, and Low-cost Housing Revolving Fund in 1994	- Private sector: 214,889 units completed, 98.9% of the target - Public sector: 46,497 units completed, 36.7% of the target as inapt project sites, and high construction costs - Housing Scheme: Special Low-cost Housing Program

Table 1. *Cont.*

Phase	Backgrounds and Challenges	Initiatives of Government		Implementation Effects
		Name of Policy	**Strategies**	
1998–2010	Asian Financial Crisis from 1997 to 1998, economy breakdown, squatter problem was rising in 1990s	*Seventh Malaysia Plan (1996–2000)*	- In 1998, low-cost housing price inclined to MYR 42,000 per unit - Implementation of Low-cost Housing Revolving Fund to encourage private involvement.	- 190,597 units completed, 95.3% of the target - Housing Scheme: - Integrated People's Housing Program (SPNB), 1998
		Eighth Malaysia Plan (2001–2005)	- *Housing Development Act on Control and Licencing 1966* amended in 2002 - Computerised open registration system implemented	- 210,529 units completed, 85% of the target - Housing Scheme: *Program Perumahan Mampu Milik; Program Perumahan Mesra Rakyat*
		Ninth Malaysia Plan (2006–2010)	- Provision of adequate, affordable, and quality houses, with greater emphasis on appropriate locations and conducive living environment	- 95,800 units completed, 91.2% of the target - Housing scheme: *Program Perumahan Rakyat; Program Perumahan Mesra Rakyat*
2011–2015	In 2010, *National Transformation Policy* was introduced to achieve the *Government Transformation Programme.*	*Tenth Malaysia Plan (2011–2015); National Housing Policy, 2012*	- Implementation of the Build-Then-Sell concept - Enforcement of government to include 20% low-cost and 20% medium-cost housing units in housing projects - Launch of new financing schemes - Launch of maintenance programme to maintain the condition of affordable housing	- 102,201 units completed or 56.3% of the target - Various housing schemes introduced for both low- and middle-income households
2016–now	Unsold property in Malaysia due to mismatch of supply and demand and unaffordable housing price for the target group	*Eleventh Malaysia Plan (2016–2020); National Housing Policy (2018–2025); National Affordable Housing Policy, 2019*	- Construction of affordable housing on waqf land (land donated by Muslim society for charitable purpose) - Development of the National Housing Data Banking system - Introduction of the Rent-to-Own financing scheme - Introduction of the Home Ownership Campaign in 2019	- From 2016 to 2017, 139,329 units completed or 30.9% of the target - Various affordable housing programs launched for those low- and middle-income households

Source: Tabulated by the authors according to relative documents [37–54].

3.1. Low-Cost Housing Development after Independence: 1957–1970

After Malaysia gained its independence in 1957, the government started looking into squatter and overcrowding problems within housing developments caused by rural–urban migration. A small amount of the national budget was allocated for low-cost housing development under the *First Development Plan for Malaysia* and the *Second Five Year Plan (1956–1965)*. Housing development was not the priority of the government but housing provision for civil servants was [36]. This resulted in the construction of 23,236 government quarters and 8938 low-cost homes for civil employees and low-income groups, respectively, by the government [37].

From 1966 to 1970, squatter and slum problems gained more attention. According to Yusoff [37], laws were enacted for squatter clearance, such as *The Emergency (Essential*

Powers) Clearance of Squatters Regulation (Laws of Malaysia 1969), *Kuala Lumpur Federal Capital (Clearance of Squatters) Bylaw* (Kuala Lumpur City Hall 1963), and *Section 425 of the National Land Code* (Laws of Malaysia 1965). The *First Malaysia Plan (1966–1970)* stated the goal of improving the well-being of low-income groups, making the construction of low-cost housing a milestone in achieving the goal. In 1967, the "Housing Crash Programme" was implemented as the initiative of government to provide low-cost housing and 32 to 50 low-cost houses were constructed in the areas without low-cost housing [38]. During this period, a total of 21,790 units were constructed, meeting 73% of the target, as one of the great endeavours of the government in promoting the well-being of low-income groups.

3.2. Housing the Poor: 1971–1985

After the race riots tragedy of 13 May 1969 due to income and social inequality, the *New Economic Policy (NEP)* was launched in 1971 to address the socio-economic gaps. Many housing programs were carried out to achieve one of the *NEP*'s objectives [39], i.e., to reduce and to eradicate poverty in Bumiputera (Malays and indigenous people of Malaysia). The quota system was introduced in housing development to make it mandatory for developers to include 30% of low-cost housing in most residential projects [40]. The "Core Housing" concept was unveiled under the *Second Malaysia Plan (1971–1975)* which was designed to provide low-income groups with very basic accommodation, allowing them to expand and improve their housing according to their economic conditions [37]. In the *Third Malaysia Plan (1976–1980)*, several initiatives were implemented to control the housing cost, such as increasing the building density, decreasing the unit floor-area, reducing the front porch, and lowering the infrastructure facility standard. To accelerate low-cost housing construction, the government provided funding and extended the loan repayment period from 20 to 25 years for developers [41]. During the *Fourth Malaysia Plan (1981–1985)*, the "Low-Cost Housing" concept was implemented which stressed the production of low-cost housing in urban areas [36]. In 1981, the government enforced that 30–50% of private housing projects should be low-cost housing with a maximum cost of MYR 25,000 per unit, forcing the involvement of the private sector in low-cost housing development [39]. Since then, low-cost housing development has been one of the goals in every five-year national development plan.

In terms of performance, the low-cost housing development increased from 1971 to 1985. Under the *Second Malaysia Plan (1971–1975)*, 13,244 units were completed, achieving 50.5% of the target. Housing rose to 26,000 units under the *Third Malaysia Plan (1976–1980)*. However, it only achieved 35% of the target due to the reduced role and the lack of manpower of the reshuffled housing ministry [42]. Under the *Fourth Malaysia Plan (1981–1985)*, the public and private sectors contributed 71,310 (40.4% of the target) and 19,170 (21.9% of the target) low-cost houses, respectively [37].

3.3. Housing Market Reform: 1986–1997

From 1986 to 1987, Malaysia's economy was in recession due to the global financial crisis, resulting in a reduction in the government's budget for housing development in the *Fifth Malaysia Plan (1986–1990)* and the *Sixth Malaysia Plan (1991–1995)*. The housing policy then was stipulated in line with the goal of international institutions, such as the World Bank and the International Monetary Fund, to promote an open market and to reduce government involvement in business affairs [39]. Under the *Fifth Malaysia Plan*, the institution of the One Stop Agency was established to facilitate the approval of housing project applications and to help developers obtain bank loans, and the Recovery Fund for Abandoned Housing Project was initiated to help developers complete their abandoned projects. Under the *Sixth Malaysia Plan*, while the concept of "Human Settlement" was implemented in housing schemes to take into consideration the need for social facilities, housing types, and financial accessibility for low-income groups [36], the cross-subsidies method was implemented to allow developers to cover the loss from low-cost housing

with a gain from ordinary housing by charging higher prices. Funding was established to speed up the provision of low-cost housing.

During this period, the total low-cost housing production increased to hundreds of thousands of homes, with the majority being supplied by the private sector. Under the *Fifth Malaysia Plan*, the private and the public sectors completed 88,880 (24% of the target) and 74,330 units (61% of the target) of low-cost housing, respectively [43]. Under the *Sixth Malaysia Plan*, the low-cost housing production reached its peak of 261,386 units, with 82.2%, i.e., 214,889 units from the private sector and 46,497 units from the public sector [44].

3.4. Slum Clearance: 1998–2011

In the Asian Financial Crisis of 1998, the challenges of economic turmoil urged the Malaysian government to establish the Economic Action Council to improve economic growth and to address the squatter problem. In 1998, the Malaysian government launched a special low-cost housing program, i.e., the Integrated People's Housing Program, to relocate the squatters in urban areas, especially those in Kuala Lumpur, by raising the maximum low-cost housing price from MYR 25,000 to MYR 42,000 per unit in view of the non-profitability caused by high land, infrastructure, and development costs in CBD areas [39]. By allowing developers to gain more competitive profits, this readjustment showed the government's initiative in encouraging the greater involvement of both public and private developers in low-cost housing development. In 2002, the *Housing Development Act on Control and Licencing 1966* was amended to improve the effectiveness of housing development [45]. At the same time, the Computerised Open Registration System was implemented as part of the screening process of eligible buyers.

In terms of policy performance, under the *Seventh Malaysia Plan (1996–2000)*, 95.3% of the target of 190,597 units was achieved, among which the private sector contributed 129,598 units [46]. Under the *Eighth Malaysia Plan (2001–2005)*, the public sector completed 113,235 units and achieved 54.4% of the target, while the private sector completed 97,294 units and achieved more than double the target, respectively. During the period of the *Ninth Malaysia Plan (2006–2010)*, housing development continued to focus on the provision of adequate, affordable, and quality houses for all Malaysians, with a greater emphasis on appropriate locations and conducive living environments [47]. As the housing market was led by the private sector and supported by the public sector, the private sector contributed more in high-cost housing, with its contribution to low-cost housing gradually decreasing.

3.5. First Affordable Housing Initiative: 2011–2015

The *National Transformation Policy* was introduced in 2010. Under the *Government Transformation Programme*, seven National Key Results Areas were identified as being in urgent need for drastic actions from the government. Among them, two areas, i.e., "raising living standard of low-income households" and "improving rural basic infrastructure", were correlated to housing development. Over the years the housing policies stated in the Malaysia plans had emphasised the objective of delivering affordable and sufficient housing to low-income groups and the growing number of the middle-income segment had also led to the increasing demand for affordable housing. In 2012, the *National Housing Policy* was issued, which became the direction for all relevant parties involved in housing development. It stated six thrusts and twenty policy directions to provide sufficient housing for low- and middle-income groups. In 2013, the government set up the target of building 1.1 million affordable homes in five years to meet the market demand [48] and stated that housing projects should include 20% low-cost and 20% medium-cost housing units in 2014 [49]. In the same period, the Build-Then-Sell concept was implemented, apart from the One Stop Centre system established in 2007, to shorten the approval process.

During this period, both the public and the private sectors, as well as the joint ventures between them, offered affordable housing to increase the accessibility of owning or renting a house. A total of 102,201 affordable houses were completed under the *Tenth Malaysia*

Plan (2011–2015) within the framework of various programmes designed to fulfil the needs of different target groups, such as Program Bantuan Rumah, Program Perumahan Rakyat, Rumah Mesra Rakyat 1Malaysia, and the Rent-to-Own Programme for low-income households, and the Perumahan Rakyat 1 Malaysia (PR1MA), 1Malaysia Civil Servants Housing (PPA1M) and Rumah Wilayah Persekutuan (RUMAWIP) for middle-income households. New financing schemes were offered, such as the My First Home Scheme, the Youth Housing Scheme, and the Private Affordable Ownership Housing Scheme (My Home), to provide financial assistance to home buyers. To maintain the condition of affordable housing, the government also implemented the Housing Maintenance Program, the 1Malaysia Maintenance Fund, and the My Beautiful Malaysia programme for public low-cost housing, private low- and medium-cost housing, and government quarters, respectively [50].

3.6. Continued Affordable Housing Development: 2016 Till Now

In 2017, the Central Bank of Malaysia declared that residential property in Malaysia had reached its peak in a decade but nearly half of the total PR1MA homes (25,132 units) were unsold as recorded on 15 November 2017, showing the mismatch between supply and demand by price [51]. The provision of PRIMA homes was priced from MYR 100,000 to MYR 400,000, where housing priced above MYR 250,000 was considered unaffordable for the target groups. Based on the Housing Cost Burden approach, the National Bank estimated in 2016 that the maximum affordable housing price should be MYR 282,000. However, the actual median housing price was MYR 313,000 [52].

In 2018, the *National Housing Policy (2018–2025)* was enacted to provide adequate and affordable housing for the needy. As a sub-policy, the *National Affordable Housing Policy*, i.e., the *DRMM*, was issued in 2019 to further address the problems of affordable housing for low- and middle-income households. Both policies outlined a set of guidelines for all parties involved in affordable housing delivery, such as the determination of price range for each state and the establishment of housing standards to be fulfilled by developers. They also described the government's initiatives in reducing affordable housing costs in terms of land price, development charge, and compliance cost, developing an integrated housing system and setting up a platform of education and advice on financial matters.

The *DRMM* created a unified policy framework for developers to build affordable and cost-saving housing for the target groups of low- and middle-income households. As a result, 458 public affordable housing projects were constructed on the waqf land through the cooperation between the Department of Waqf, Zakat dan Haj (JAWHAR), and other institutions, such as state Islamic religious councils, state governments, and local authorities. The National Housing Department developed the National Housing Data Banking System as an integrated housing information system that allowed data sharing among agencies and state governments to facilitate the coordination to determine the suitable locations of affordable housing [39]. Several financing initiatives were also provided to improve the housing affordability of low- and middle-income households, such as the Rent-to-Own financing scheme. In 2019, the Home Ownership Campaign was launched to promote Malaysian homeownership and to overcome the issue of unsold properties [53]. By the mid-term of the *Eleventh Malaysia Plan (2016–2020)*, 139,329 units and 30.9% of the target had been completed for low- and middle-income households [50], while the homeownership of low- and middle-income households was increased through various affordable housing programs. However, there was still a shortage of affordable housing in urban areas.

4. Why Do Low-Income Households Have Low Housing Affordability in Malaysia

The previous policy review shows that whilst Malaysia has made long-term efforts to overcome the housing affordability issue by implementing a series of affordable housing policies, housing affordability in Malaysia is still at low levels. To find out the reasons

for that paradox, the current housing affordability condition of low-income groups was analysed by comparing them with the eight identified influencing factors.

4.1. Low Household Income

Based on the Household Income and Basic Amenities survey in 2019 [6], the average Malaysian earns MYR 5873 per month with an annual median household income of MYR 70,476. Hence, an affordable housing price should not exceed MYR 211,428 based on three times the median multiple. However, the median housing price at MYR 426,155 makes residential houses seriously unaffordable for many Malaysians [1]. The 2019 Household Income and Basic Amenities survey showed that low-income groups (16% of Malaysia's households) were earning MYR 3166 and below and that half of the total households in Malaysia were not earning more than the median household income of MYR 5873 [6]. Data from the Employees Provident Fund (EPF) showed that 89% of Malaysian employees had a monthly salary of less than MYR 5000 and the majority of low-income households barely had enough funds after their retirements [54]. It means that the low household income makes the majority of Malaysians unable to afford and own a house.

4.2. High Land Cost

In Malaysia, the cost of land accounts for 20% of the total housing development costs and is considered as one of the largest proportions of property development expenses [14]. Therefore, the high land cost is critical to the viability of affordable housing for all Malaysians.

4.3. High Construction Cost

In Malaysia, the costs for infrastructure, building materials, and labour potentially influence housing affordability when the economy changes [23,24]. Many developers face challenges of skilled worker shortages on construction projects. According to Ramli et al. [55], 80% of the Malaysian governments' projects fall behind schedule as a consequence of poorly qualified contracted technical staff. Delays in construction projects then exert extra pressure on total construction costs. In consequence, developers launch higher housing prices after considering all the construction costs to boost profit margins.

4.4. High Compliance Cost

In Malaysia, high compliance costs from various governmental regulations, such as title application, land conversion, and project approval further increase housing prices, leading to low housing affordability [23,26]. Three factors contribute to the high compliance cost, i.e., the inefficiency of the housing delivery process and system, the corrupt bureaucrats, and the distinction of power that discourages cooperation between federal and state governments [24]. The development approval process consists of various permits that involves many government agencies from both federal and local levels which have different bureaucratic processes, which often leads to developers choosing to undertake unnecessary transactions to speed up the approval process. This may acquire extra processing charges and can increase the developer's final selling price. Based on the Real Estate and Housing Developers' Association of Malaysia (REHDA) survey, compliance costs can range from 2.8% to 19.9% of the Gross Development Value (GDV) for high-rise developments. It can range from 9.5% to 35.1% of the GDV for land development [56]. These costs are inevitably and ultimately reflected in the increase in housing prices.

4.5. Mismatch between Supply and Demand in Terms of Quantity

In Malaysia, the construction of affordable housing has fallen behind the target provision for years, which means that the supply of affordable housing can only partially respond to the cyclical changes in demand. Yet, the demand for affordable housing from low-income households continues to grow due to high population density and rapid popu-

lation growth. An insufficient housing supply ultimately leads to an increase in housing prices, consequently affecting housing affordability.

4.6. Instability of National Economy

Indeed, in Malaysia, economic growth does not help improve affordability, while the affordability is affected by the unstable economy in terms of a weak currency, the depreciated value of the Malaysian Ringgit, and inflation [23]. So far, taxation is not an issue for Malaysian housing affordability as there is a property tax exemption for low-cost housing and affordable housing as well [57].

4.7. Low Capability of Home Financing

In Malaysia, housing loans are becoming more difficult to obtain while the loan approval process is getting longer. Housing loans with high interest rates imposed by banks cause high monthly installments, making housing units pricey and unaffordable for households [15,18]. Besides monthly instalments, households have to pay for monthly maintenance fees, causing further financial burdens for already low-income households [58].

4.8. Incomprehensive Housing Planning Due to Information Insufficiency

In 2013/2014, Malaysia experienced a high rise in housing prices. Locations and sizes were also mismatched with the market demand due to the insufficient analysis on household data. Inaccurate data contributed to false perceptions by developers on market demand that consequently resulted in vacant housing and impacted housing affordability [59]. The *National Housing Policy* is not well implemented due to a faulty market analysis and insufficient information. Hence, the long-term implementation of housing plans has not significantly improved Malaysian housing affordability as expected.

5. Can the *DRMM* Guarantee Housing Affordability of Low-Income Households

As a sub-policy prepared by the MHLG through the National Housing Department, the *DRMM* aims to overcome five identified challenges of affordable housing development in Malaysia more comprehensively, i.e., unaffordable housing price; imbalanced housing supply and demand; housing product mismatch; insufficient coordination; and failure of financial support, with regard to which six objectives are targeted including ensuring housing affordability. To achieve the objectives, a number of strategies are prescribed in accordance with the criteria of affordable housing and government's initiatives. The following discusses the results of the evaluation of the *DRMM* strategies to overcome housing affordability with reference to the eight influential factors affecting Malaysia's housing affordability analyzed in the previous section.

5.1. Strategy 1: Centralise Affordable Housing Authority

According to the *DRMM*, the Malaysian government aims to build one million affordable homes for low-income households within 10 years, commencing in 2019, to raise their homeownership [60]. However, it is quite challenging because there are more than 20 agencies at both federal and state levels that are involved in affordable housing development. They are neither integrated nor coordinated, and due to that, the housing that is supplied often does not match well with the actual demand. Thus, the DRMM strategy for centralised housing authority is mandated to improve housing affordability. To coordinate the fragmented federal and state governments' agencies, the Malaysian government has empowered the MHLG to act as the central housing agency and authority that coordinates all affordable housing projects. It is hoped that, by centralising the housing agencies and authorities, more comprehensive housing planning and urban development frameworks will be set up to strengthen the effectiveness of housing policies.

5.2. Strategy 2: Create a Unified Housing Database

Currently, Malaysia does not have a unified database on the housing market that provides necessary information on households. The information insufficiency makes it difficult to supply housing effectively to meet the actual demand, resulting in many unsold residential properties, including affordable housing. The data issued by the National Property Information Centre in 2020 showed that the sum of unsold units in Malaysia increased almost three times over a five-year period, from 10,897 units in 2015 to 30,664 units in 2019 [34]. Regarding this matter, the *DRMM* mandates that an integrated housing database is developed that is beneficial for future affordable housing planning. The database will gather household data including economic status, family composition, and housing preferences through nationwide housing surveys. This will enable governments and developers to make more accurate estimations on the shortage of affordable housing and allocate affordable housing more precisely by identifying the potential and eligible buyers. Of course, the cooperation of all parties is needed in developing this integrated housing database.

5.3. Strategy 3: Strengthen Development Control

Development control is an integral part of planning practice and is essential to manage and regulate property development. Good development control can boost the effectiveness of housing provision, can help reach market equilibrium, and can eventually overcome the housing affordability issue [61]. In Malaysia, the administration of development control is within the exclusive power of the State Government and is subject to the consideration of the State Government Council. Therefore, the guidelines of the *DRMM* prescribe that the State Government Council is responsible for making comprehensive reviews on property market, conducting demand and supply studies, and providing strong justifications if there are any exceptions to the conditions such as changes in the percentage of affordable housing provision, conversion, and the relocation of land. Developers are subjected to penalties if they do not obey the government plans in delivering affordable housing. A quota system is stipulated to encourage the balance of housing development and to increase the supply of affordable housing, i.e., at least 30% of the total development project must be affordable housing and no less than 30% of affordable housing must be allocated to bumiputera. Each state government determines the quota based on the States' Guidelines on Bumiputera Quotas from Real Estate and Housing Developers' Association of Malaysia Institute (REHDA).

5.4. Strategy 4: Control Affordable Housing Price

As mentioned earlier, it is common sense that high housing prices are affecting Malaysia's housing affordability, especially for low-income groups. An adjustment of the housing price through the Median Multiple approach is required to ensure housing supply and to meet the market demand in terms of quantity, as well as to improve Malaysian housing affordability. Based on the median multiple measurement, the *DRMM* fixes the affordable housing prices for urban and rural areas in each state by determining the median household income from the Investigation Report of Household Income and Basic Facilities in 2016. Specifically, Kuala Lumpur will have the highest affordable housing price of MYR 326,628, followed by Putrajaya (MYR 297,900), and Selangor (MYR 267,948). By taking the average median household income of these three states (MYR 8191), the maximum affordable housing price is fixed at MYR 300,000. For the states that are less developed, such as Kelantan, Kedah, Perlis, and Perak, the maximum affordable housing price is fixed at MYR 150,000. In short, the *DRMM* fixes the affordable housing prices in two categories, i.e., below MYR 150,000 and between maximum MYR 300,000. Both price categories are considered affordable. Developers are mandated to provide affordable housing within the price range, so as to prevent them from adjusting housing profit margins as they wish.

5.5. Strategy 5: Prepare Land for Affordable Housing

Continuous urbanization has increased housing demand in Malaysian cities, leading to an increase in housing prices and an effect on housing affordability. High land price is one of the factors increasing housing prices. In Malaysia, the land price usually depends on housing demand and market price. To reduce housing prices, the government plans to develop affordable housing on government lands. The MHLG and State Governments play a vital role in land preparation. In view of the expensive land price and scarcity of land in Malaysia, particularly in its urban areas, the *DRMM* highlights their role in preparing land for affordable housing as follows:

1. The DRMM encourages state governments to cooperate with the private sector for affordable housing developments;
2. The DRMM suggests state governments propose suitable lands for affordable housing development before submitting the project to the MHLG;
3. The DRMM mandates the formation by the MHLG of an Affordable Housing Implementation Evaluation Committee to evaluate the effectiveness of the construction methods and the costs of affordable housing for the government;
4. The DRMM mandates that the MHLG is authorised by the federal government through the Federal Land Commission to be responsible for planning, coordinating, and developing affordable housing.

Therefore, by offering affordable housing land for free or for nominal fees, the government can reduce the land price in the housing market and improve housing affordability.

5.6. Strategy 6: Reduce Construction Cost

Generally, construction cost accounts for the majority of new housing price in Malaysia. To improve the efficiency and effectiveness of delivering affordable housing projects and to reduce the construction cost while assuring construction safety, the *DRMM* mandates developers to adopt the Industrialised Building System (IBS) and encourages them to use Building Information Modelling (BIM) technology in affordable housing construction. The government also provides incentives and tax exemption on machines and tools for affordable housing construction to support the implementation of IBS. Obviously, the reduction in construction cost can help to reduce housing prices and then improve housing affordability.

5.7. Strategy 7: Reduce Compliance Cost

A high compliance cost is a burden on developers in Malaysian housing projects that impacts housing price and housing affordability. The *DRMM* promotes the state and local governments to reduce or exclude development and compliance costs. For instance:

1. Impose lower development charges;
2. Accelerate the approval process and provide a density bonus for affordable housing projects;
3. Impose lower land premiums (extension of leasehold, land alienation, and amalgamation) and land use conversion costs;
4. Exclude/reduce compliance costs imposed by the state and local governments on affordable housing projects.

With the exception and reduction in compliance costs, housing prices will decrease, and the government can supply more affordable housing, particularly in urban areas and strategic locations.

5.8. Strategy 8: Ensure Appropriate Dwelling Conditions

Inaccurate information delivered by the government meant that developers failed to construct suitable housing types and sizes, which led to the mismatch between market demand and supply of liveable affordable housing. Therefore, it is necessary for the government to include the criteria of appropriate dwelling conditions for affordable housing in the housing policy. The *DRMM* specifies several criteria as the guidelines for all parties

involved in affordable housing projects to deliver affordable housing with conducive and appropriate dwelling conditions, such as building design, unit floor area, housing density, and facilities. These criteria of appropriate dwelling conditions are expected to make affordable housing projects more adaptable to household expectations and market demands.

5.9. Strategy 9: Improve Household Financial Literacy

Financial literacy is vital to avoid household debt. According to the Central Bank of Malaysia's Financial Capability and Inclusion Demand Side Survey 2018, one in three Malaysians deems that they have little financial knowledge, especially those in low-income households [62]. Poor financial management generally stems from a lack of financial knowledge and the capability to make good financial decisions, weakening their housing affordability when they come across a home that they can potentially purchase. Therefore, the *DRMM* mandates the Central Bank of Malaysia and its management agency AKPK to establish the Credit Counselling system to educate and advice the public on financial matters. This will improve an individual's financing ability and assist them in their home purchasing journey and ensure housing affordability.

5.10. Strategy 10: Launch Various Housing Financing Schemes

The *DRMM* encourages the government to launch various housing financing schemes for low- and middle-income groups in order to raise their homeownership. For instance, the Housing Loan Scheme, My Home, Financing under Syarikat Perumahan Negara Berhad Funding, My First Home Scheme, Depositku, PR1MA-Rent-To-Own, Government Housing Loan Scheme, EPF Partial Withdrawal for house purchase, and Rent-to-own for People Housing Program, etc. These financing schemes assist households who are not eligible for financing to purchase a house through relaxed lending criteria by lowering interest rates for borrowing. Through the 2019 Budget, six available housing financing initiatives have been promoted, i.e., the Flexi Financial Financing Scheme (middle-income group), the Subsidy Financing Scheme (low-income group), Extension of LPPSA Financing Period, Cagamas Berhad, MyHome Fund (Crowd Funding) and Plus Discount (zero deposit). Various housing financing schemes can help the potential buyers of affordable housing to reduce their financial burdens and to ensure their housing affordability.

5.11. Summary

Based on the above evaluation, Figure 1 shows the ten strategies prescribed in the *DRMM* in correlation to the key factors affecting housing affordability. Four strategies, i.e., centralising affordable housing authority, creating a unified housing database, strengthening development control, and ensuring appropriate dwelling conditions are prescribed to comprehend housing planning in Malaysia. Strengthening development control and controlling housing prices are vital to balance housing supply and demand in terms of quantity. Strategies of land preparation for affordable housing and a reduction in compliance costs and construction costs are correlated with the factor of high housing costs that influences housing affordability. The strategies of improving household financial literacy and launching various housing financing schemes can help improve home financing ability. In short, the *DRMM* strategies are anticipated to effectively improve housing affordability by supplying more precisely affordable housing, lowering housing costs, and improving home financing ability. However, household income and economic factors are excluded in the *DRMM*. In fact, they are the most critical factors as money always comes first when dealing with homeownership. As mentioned earlier, housing affordability is highly dependent on household income. To guarantee housing affordability, household income should be steadily increased, particularly in view of its relevance to housing prices. This, of course, depends on the strength of the national economy, which affects not only government's ability to deliver enough affordable housing but also the job opportunities and wage levels for households. Thus, the *DRMM* strategies could not guarantee housing affordability of low-income households without any consideration of these two factors. To further improve

the anticipated effectiveness of housing affordability, due attention should be paid to the two factors in future decision-making, while the current affordable housing policies that prove to be effective should be continuously enforced, and the existing affordable housing stocks should be more efficiently utilised.

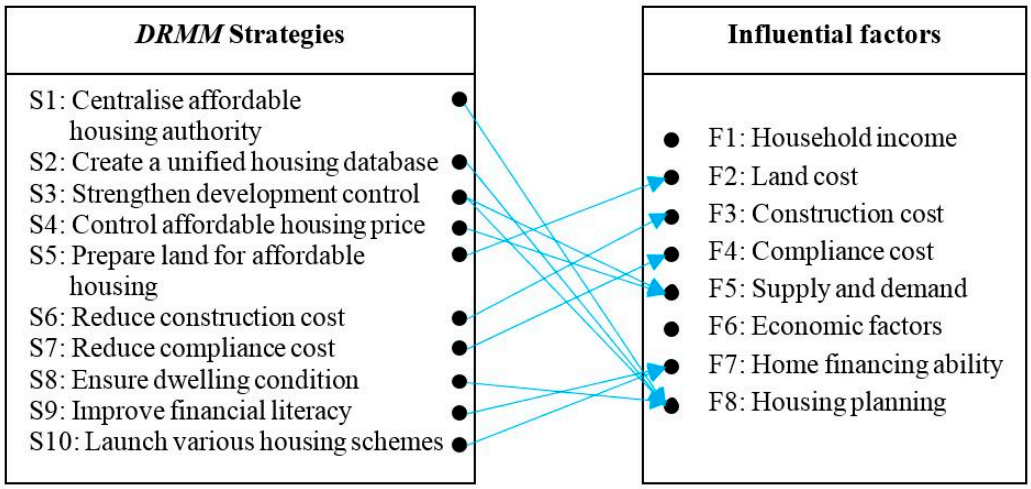

Figure 1. Results between the *DRMM* strategies and the factors affecting housing affordability.

6. Conclusions

In Malaysia, low-cost housing has been injected into its affordable housing policy and has evolved through the Malaysian five-year plans since its independence until 2012, when a formal housing policy was established as a *National Housing Policy*. Through this evolution, the government realised the necessity of managing affordable housing development more effectively and introduced the *National Affordable Housing Policy* in 2019. Over the decades, the government has taken different initiatives and focused on different target groups in affordable housing development. In the early period, the principle of affordable housing development was to provide low-cost housing for low-income groups. When the time passed and the demand of M40 for affordable housing increased, the government began to develop median-cost affordable housing for M40. This led to a scenario where more parties had the opportunity to be involved in affordable housing projects. Consequently, the housing development projects were changed from public sector-led to private sector-led and then were turned into joint ventures between the public and private sectors. Housing affordability has become the main concern of Malaysia's housing policy after efforts for decades, leading to the formulation of a specific housing policy to strengthen the government's initiatives in overcoming the housing affordability issue. The policy review shows that the housing affordability of low-income groups is still not guaranteed though Malaysia has long implemented affordable housing policies to improve housing affordability.

The reasons that cause low housing affordability among low-income groups are low household income, high land cost, construction cost, compliance cost, mismatch of supply and demand in terms of quantity, instability of national economy, low home financing ability, and incomprehensive housing planning due to information insufficiency. They also explain why the long-term implementation of housing policies cannot significantly guarantee Malaysian housing affordability as expected. In particular, insufficient analysis on household data that delivered inaccurate statistics to developers has caused a mismatch of housing supply and demand in terms of type of properties and location, resulting in a high vacancy rate of affordable housing and low housing affordability. The *DRMM* was anticipated to effectively improve the housing affordability of low-income groups in three aspects: (1) supply affordable housing more precisely by implementing the strategy of centralised affordable housing authority, creating a unified housing database, strengthening development control and ensuring appropriate dwelling condition; (2) reduce housing costs

by preparing land for affordable housing and reducing compliance cost and construction cost; and (3) improve home financing ability by improving financial literacy and offering various housing schemes. However, the exclusion of household income and economic factors may cause the ineffectiveness of the *DRMM* and, as a result, housing affordability of low-income households cannot be guaranteed.

Moreover, according to international experiences [63], income mixture and sustained rehabilitation are currently two trends of affordable housing development for low-income households, both of which have a positive effect on creating job opportunities for low-income households, so as to increase their household income and ensure their economic self-sufficiency [64–66]. Taking that into consideration, some recommendations are put forward here for the prospects of future Malaysian affordable housing development, which are divided into two perspectives, i.e., new affordable housing and abandoned or vacant affordable housing.

On the one hand, to effectively supply new affordable housing, the government should pay attention to the core problem, i.e., the mismatch of housing supply and demand in terms of housing price, type, and location. The five strategies that have been prescribed in the *DRMM* should be enforced to combat this situation, (1) centralise the affordable housing authority to develop more comprehensive housing planning and urban development framework; (2) create a unified housing database to produce a more accurate analysis of housing demand and supply; (3) strengthen development control to deliver adequate affordable housing and meet the market demand; (4) ensure appropriate dwelling conditions to meet household expectations; and (5) control affordable housing prices to ensure that they are within the range of household affordability. Besides the enforcement of those five strategies, international experiences such as in the U.S. [63] and in France [67] provided good lessons that new affordable housing should be encouraged along with mixed-income developments to promote social integration and to avoid a large concentration of low-income households that can lead to social problems in residential areas.

On the other hand, based on international experiences, abandoned or vacant affordable housing in Malaysia could be addressed through rehabilitation in view of their actual deficiencies. According to the Association of Valuers, Property Managers, Estate Agents and Property Consultants in the Private Sector Malaysia (PEPS), unsold housing is due to indiscriminate building by developers. Usually, the dwelling conditions such as housing size and facilities do not meet the national housing standards, consequently affecting the quality of life of residents. Unsold housing is also caused by the large concentration of low-income groups, the poor management of building facilities, and inadequate maintenance, resulting in poor living environments [68]. Hence, to effectively rehabilitate the abandoned or vacant housing, affordable housing should be redesigned and rehabilitated in line with the market demand, and facilities and services should be strengthened, thereby ensuring a better quality of life for residents, and improving the quality of their living environment. Spirit Quarters in England is one of the successful rehabilitation schemes that transformed the vacant housing into a new residential area with 1400 housing through the improvement of community facilities, environment, employment, and education measures [69]. A case study of urban revitalization in West Philadelphia showed that a higher employment rate and a higher education level helped to increase the average household income [64]. Moreover, it is important to ensure that rehabilitation programmes are supported with enough financial supports and the building of mixed-income communities is emphasised. For instance, the EU Structural Fund was established to promote urban regeneration and social inclusion in European countries [70]. In short, rehabilitation does not merely address the issue of vacant affordable housing, but it also fosters the rise of mixed-income communities and long-term community revitalisation by improving their living environment and economic status. Although rehabilitation is neglected in the *DRMM*, it could be a new initiative in future policy making.

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Housing Cost Burdens and Parental Support for Young Renters in South Korea

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Abstract: In Korea, the housing issues faced by young renters negatively impact both their parents and themselves. This study aimed at exploring young renters' situations whereby they receive financial support from their parents in order to pay current housing expenses, and their perception of housing cost burdens. Additionally, this study examined the influences on the reception of parental support and their perceived housing cost burdens. In February and March of 2021, an online questionnaire survey was conducted amongst young renters living independently from their parents and 385 responses from Jeonse renters and monthly renters with deposits in private rental housing units were analyzed. The major findings are as follows: (1) among the subjects, 43.4% had experienced receiving parental support in order to pay for housing expenses since their first instance of independent living, and 35.6% were still receiving parental support. (2) A discriminant model with a linear combination of the variables of age, income, residential location and rental deposit was found effective in predicting the receipt of parental support with 66.5% accuracy. (3) A linear combination of the variables of gender, rental deposit and monthly cash housing expenses was found to explain 5.8% of the total variance of perceived housing cost burdens. The results imply the necessity to expand the provision of public housing and housing subsidies to alleviate the financial burdens of young renters and their parents.

Keywords: young adults; renters; housing costs; parental supports; discriminant analysis; regression analysis; independent living; housing affordability

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1. Introduction

Achieving residential independence from the parental home has been considered as an important goal for most young adults. However, since the advent of the global financial crisis, the severity of the housing problem of young people has intensified more than ever before in many countries. In particular, the housing problems of young people have further manifested due to common factors such as increased youth unemployment worldwide, longer education periods, higher student loans which must be repaid, a lack of available housing in the market and increased rent burdens overall [1]. While the proportion of young people living in their parents' homes for longer than was typical in the past continues to increase, more severe pessimism about life is prevailing among the younger generation, who had enjoyed their free lives with a higher level of education than their parents' generation. This is in addition to experiencing social imbalance and unfairness amid the fierce competition stemming from a scarcity of employment opportunities and housing shortages. In fact, it was found that the quality of life of young people was in fact worse when compared to that of their parents' generation, and high housing prices have often been pointed to as the main reason for this [1–4].

The excessive burden of housing costs for independent adult children can even cause them to return to their parents' homes in certain situations [5–9]. Concerns are growing

over the housing problems of young people in many countries, given that the problem of prolonged periods during which adult children are not completely financially and physically independent from their parents is often linked to delayed marriage and childbirth, making it difficult for them to move onto the next stage of life and to form new families [2,10–13].

The housing problem of young people in South Korea is manifested in various aspects, such as the increase in the number of adult children who are not yet independent from their parents [9,14], as well as the burden of housing costs for independent young people and the overall quality of available housing [13,15–20]. The severity of the housing problems of young people is significant in that it is not merely a one-dimensional problem of housing, but it easily evolves into various social problems. In addition, due to the sentiments of Korea, whether the housing cost of independent adult children is passed onto their parents and interferes with parents' preparation for retirement, and the degree to which parents can financially support their children can affect the possibility of independence and the level of independent housing of adult children, leading to social conflicts [21–23].

In South Korea, the problems of young people have been excluded from the accessibility of social welfare under the perception that such problems should rather be solved by their parents and their families, leading to the lack of policy being the main reason for the worsening of the housing issue, and thereby making housing and financial independence even more difficult [13,24]. In the past, poor living conditions were temporary and transitional, but now education, employment, income and housing inequality are more likely to become fixed at a certain level as they become more structured over time. Additionally, parental support was also part of this in the past, but now social inequality is likely to be reproduced in the housing sector as the gap has continued to widen depending on whether parents are able to provide support. In addition, the transition to the life stages of marriage, childbirth and child parenting, which had continued despite difficult housing conditions in the past, is now leading to higher rates of non-marriage, late marriage, delayed childbirth and abandonment, thereby undermining social vitality and halting sustainable development [13,25]. In addition, given the global impact of the COVID-19 pandemic and low economic growth, South Korean young people are also concerned about various other deteriorating circumstances, such as a lack of stable jobs, instability in entering the housing market, limited funding capabilities and deepening dependence on their parents [13,14,19,26].

Accordingly, the South Korean government is considering various measures for housing support policies for young people, such as an extended supply of public rental housing for young people and the general easing of housing costs. However, given the somewhat special life cycle stages of young people, which are temporary and transitional, this falls short of meeting the housing needs expected [13,26,27].

Against this background, in this study, we conducted a questionnaire survey of young renter households living independently from their parents. The purpose of this study was to empirically identify the current status of housing cost support from parents of young renter households, their perception of the burden of housing costs, and factors influencing them and to suggest policy application points. As housing affordability is strongly related to social stability and sustainability, results from this paper are expected to ultimately contribute to the enhancement of social sustainability.

The subsequent part of this paper consists of five sections as follows. Section 2 provides background information on the rental system, regional classification, young renters' housing issues and housing support programs for young renters in South Korea for a better understanding of the study. Section 3 describes the research methodology. Section 4 reports detailed findings from a series of statistical analyses. Section 5 provides summaries of findings and implications. Finally, Section 6 concludes this study.

2. Literature Review

2.1. Rental System in South Korea

The most frequent rental types in Korea consist of Jeonse and monthly rentals with deposits. These two types differ from each other in terms of the composition of the rental costs. A Jeonse renter pays a lump sum deposit when their lease begins, and does not pay monthly cash rent. A monthly renter with a deposit pays both the lump sum deposit, which is relatively lower than that of Jeonse renters, in addition to a monthly cash rent. Regardless of the tenure types, the rental deposit is fully refundable when the lease is terminated. According to the Korea Housing Survey 2019 [28], 19.7% of households were monthly renters with deposits, and 15.1% were Jeonse renters (Table 1). Other rental types consist of monthly rentals without deposits, yearly, weekly or daily rentals, and so on, which are generally associated with indecent housing or poor neighborhood quality.

Table 1. Housing tenure types in Korea (2019).

Tenure Type	%
Homeowner	58.0
Jeonse renter	15.1
Monthly renter with deposit	19.7
Other type renter [1]	2.6
No-rent occupant	3.9
TOTAL	100.0

Source: Korea Housing Survey 2019: Research report (general households), p.64, Table III-16 (reorganization of the table) [28]. [1] Including monthly renters without deposit, yearly, weekly and daily renters.

As Jeonse renters do not have to pay monthly cash rent, which allows for a greater chance to amass higher savings for a future home purchase, Jeonse is the most preferred rental type. However, as the Jeonse deposit is extremely high, at around 60 to 70 percent (or sometimes even higher) of the sales price of the properties in most areas, not all renters can achieve the capital to participate in Jeonse rental. In June 2021, the ratio of Jeonse deposit amounts to sales prices measured at 64.7% nationwide, and 61.4% in Seoul [29]. In extreme cases, the Jeonse deposit could be even higher than the sale price in an area where people are reluctant to purchase a home due to the instability of the housing market.

According to the rental housing statistics provided by MOLIT [30] and the Korea Housing Survey 2019 [28], there were 1,570,242 public housing units in 2018 which were presumed to comprise around 18.9% of the total rental housing stocks of that year.

2.2. Classification of Regions in South Korea

Seoul is the capital of Korea. In addition to Seoul, there are six metropolitan cities (Incheon, Busan, Daegu, Gwangju, Daejeon, Ulsan) and nine "Do" areas (provinces) in Korea. In housing research studies and government reports, it is typical to classify the regions into the capital region (CR), non-CR metropolitan cities and other areas. CR includes Seoul, Incheon metropolitan city and Gyeonggi-do. Other areas are Sejong City and eight "Do" areas excluding Gyeonggi-do. CR can be further classified into Seoul, and Incheon and Gyeonggi-do (Table 2). The study areas of this paper are limited to CR and five non-CR metropolitan cities.

2.3. The Housing Issues of Young Renters in South Korea

2.3.1. High Costs of Housing and Improper Housing Quality

In South Korea, there are a large number of single-person households (59.2%), the majority of young people live in rented housing units (77.4%) and the proportion of monthly rental households (64.9%) is higher than that of Jeonse households (35.1%) [28]. As explained earlier, the Jeonse rental type has the advantage of allowing the renter to accumulate assets without paying monthly rent, but it is not easy for young people without initial assets to afford the lease deposit on their own, as they have to pay a large deposit of more than 60% of the sales price at the time of the start of the lease. At the same time, this

trend towards living with monthly rent with a smaller deposit than Jeonse and a higher monthly rental fee has been growing over time [20,31].

Table 2. Regional classification of Korea.

Classification		Area
Capital Region (CR)	Seoul	Seoul Metropolitan City
	Incheon & Gyeonggi-do	Incheon Metropolitan City Gyeonggi-do
Non-CR metropolitan cities		Busan Metropolitan City Daegu Metropolitan City Gwangju Metropolitan City Daejeon Metropolitan City Ulsan Metropolitan City
Other areas		Sejong City Gangwon-do Chungcheongnam-do Chungcheongbuk-do Jeollanam-do Jeollabuk-do Gyeongsangnam-do Gyeonsangbuk-do Jeju-do

According to a survey by KRIHS, among young single-person renter households, 30.8% were found to be experiencing excessive housing costs, with the RIR (rent-to-income ratio) exceeding 30%. In addition, the proportion of households that do not meet the minimum housing standards was shown to be at 11.4%, indicating that they are living in poor housing conditions [20]. To ease the burden of high housing costs, many young people have no choice but to give up the quality of their own housing and choose poor living conditions that do not meet the minimum housing standards, rooftop houses, basement houses or cheap lodging towns, which are relatively more affordable [19].

The proportion of young households experiencing such an excessive burden of housing expenses stands out among low-income single-person households, persons with lower current income and those living in metropolitan areas [32,33]. In addition, as the disparity in the proportion of rental expenses spent by poor young households compared to non-poor young households has increased by about double [18], young households who have difficulty in accumulating stable assets due to being unable to find a job or an unstable employment status are in a serious situation where they will continue to find it difficult to pay rental expenses and will continue to face poor housing conditions.

Based on a questionnaire survey distributed amongst early-career young renters in CR, Lee [21] reported that young renters' housing cost burdens tended to decrease as time passes after they first enter the workforce. The researchers interpreted that the results were due to the increase in the income level according to the increase in years in the workforce. This suggests that young renters' housing problems are likely to be easily overcome if young people would be able to receive adequate housing support in the early stages of their independence, thereby leading to their independent housing problems being solved.

2.3.2. Financial Dependence on Parents

As the excessive burden of housing costs is a factor which greatly influences life planning and decision-making, the housing cost must be at a level where assets can be adequately accumulated to prepare for the future [34]. Generally, in foreign countries, if the housing cost exceeds 25 to 30% of the individual's income, they are subject to policy benefits, but at present, in South Korea, there is currently no state subsidy system for housing expenses when the ratio of an individual's housing expenses to income exceeds

a certain level, as in most developed countries. In a situation where the problem of overburdening housing costs for young households in South Korea is excluded from policy, these individuals' housing costs will ultimately be borne by their parents [8].

According to a survey of young renters in Seoul [8], among young rental householders living with their parents, the percentage of parents paying rent accounted for 94.5%, and even if they are living independently from their parents, 49.4% of parents pay the full rent, indicating that young household renters are very dependent on their parents for housing costs (Table 3). The study reported that the reality of support for young rental households by parents was irrelevant of the employment status of young people.

Table 3. Young renters' source of rental costs according to whether or not they live with parents (Unit: %).

Source	Living with Parents	Living apart from Parents	Total
Parents only	94.5	49.4	65.0
Young adult only	1.3	26.8	17.9
Young adult + parents	2.1	8.3	6.1
Young adult + other household member	0.0	8.7	5.7
Other	2.1	7.1	1.0
TOTAL	100.0	100.0	100.0

Source: Measures to improve youth housing poverty in Seoul by activating social and economic actors. Seoul, Korea: Seoul Metropolitan Council, p. 22 [8].

As economic independence and stable housing become the top priorities for young people, the stage of marriage and childbirth will receive lower priority in the progression of their life cycles. Furthermore, if the housing cost falls outside the affordable level, young people will be forced to give up both marriage and childbirth, as well as the purchasing of a home [25,26]. For these reasons, while there is a marked tendency for adult children to more naturally recognize and accept their parents' financial support [35,36], parents continue to support their children for as long as their children need it, regardless of their employment status, marital status, age or timing, in order to ensure that their children's implementation of a life cycle can be successfully realized for as long as they can afford it [37,38]. Because the increase in housing costs is accelerating faster than the rate at which young people's economic conditions are improving [39], adult children may not be able to return all or part of the housing expenses bestowed by their parents in the early stages of independence and will use them as seed money when they renew their lease or move to their next residence [40].

As the chances of young people solving stable independence and housing problems themselves without parental support remain slim and their income has a great impact on their changes, social conflicts such as "the inheritance of wealth" which refers to inheriting or giving property to their children even through expediency and "the theory of the silver spoon and wooden spoon," have begun to emerge more [23]. In addition, the excessive burden of housing expenses weighted on young people acts as a heavy burden not only on young people themselves, but also on their families, particularly their parents, and further dissolves the necessary assets set aside for the parents' retirement, resulting in a threat to the older population's economic welfare after retirement [40,41]. Therefore, when dealing with the housing issue of youth households, it is not only the qualitative level of housing that is of concern, but also the burden of housing costs and the financial burden of the parents and families of young people, which should be considered in a nuanced manner. Institutional measures need to be taken to help adult children lead independent housing lives rather than continually relying on parental support, and the housing support for such young households is also closely related to social stability and sustainability.

In previous studies, it was reported that among young renters living independently from their parents, Jeonse renters showed the greatest tendency to receive financial support from their parents, when compared to monthly renters [13,17,22,35]. In addition, the receiving of parental support was found to be influenced by diverse demographic and housing characteristics. From an analysis of microdata drawn from the Korea Housing Survey 2014, Park and Lee [17] revealed that young renters' reception of parental support could be predicted with a linear combination of age, marital status, working status, tenure type, structure type, residential location and rental deposit with 77.2% accuracy. Lee [21] also found that as time passed since the young renters' first entry into the workforce, their financial dependence on their parents decreased.

Young renters' reception of parental support was found to have influenced not only the reduction of current housing problems, but also on the formation of their first household, in addition to their expectations for an improved housing situation in their next move. Using microdata from the Korea Housing Survey 2017, Lee and Kim [42] concluded that financial support from parents had a positive influence on alleviating young renter households' housing cost burdens and housing quality issues. Based on an analysis of the Korea Housing Survey 2014 microdata, Moon and Lee [36] explored that parental support showed a significant relationship with their adult children's likelihood of forming a new household independently from their parents, and that young renters receiving parental supports showed a stronger tendency to expect upward filtering of their tenure types and/or an upscaling of their house at the next move, compared to those who did not receive any financial support from their parents.

2.4. Housing Support Programs Targeting Young Renters

It is only recently that young people have been highlighted as a target within Korea's housing welfare policy. Since 2015, Haeng-bok House, public rental housing which is mainly targeted at young people, has begun to be supplied, and housing support policies for young households have been gradually developed and implemented after the government's Housing Welfare Roadmap 2017 [43] was announced.

2.4.1. Public Rental Housing

Haeng-bok House is a type of public rental housing that receives a low rental fee at 60–80% of the market price, and 80% of the supply is intensively supplied to young people, such as college students, those newly entering the workforce and society and newlyweds. Since Haeng-bok House was first introduced in 2015, the development of a total of 191,933 units was approved nationwide by 2019, and a total of 63,355 units were supplied as of 2019 [44,45]. Since Haeng-bok House has only recently been introduced, the supply is still very short when compared to the demand. In addition, like other public rental housing, the supply has not been speeding up in growth due to opposition from local residents who are concerned about the decline in real estate values and the possible downgrading effects of the area.

2.4.2. Financial Programs

After the government announced the Housing Welfare Roadmap 2017 [43], as a follow-up to this program announcement, from 2018, various financial products aimed only at young people have been developed using the Housing and Urban Fund. Such financial products are for young people with income levels below a certain level and are meant to cover rental deposits, monthly cash rent and home purchases with loan conditions and interest rates that are relatively favorable to young people.

From 2021, if unmarried children (aged 19–29 years old) from households receiving the housing benefits of the National Basic Living Security Program live independently from their parents, the children can also receive the housing benefits separately from their parents [45]. In addition, programs are being implemented locally with direct financial support for young people such as financial youth subsidies by some local governments.

2.5. Definition of Young Person

In previous literature in Korea, there are various ways to define a young person (or a youth, a young adult). In most studies, a young person is defined by his/her age. Depending on the studies, a young person's age can be 19 to 39 years [14,20,22,31,42], 20 to 34 years [34,36,46], 20 to 39 years [33,47–52], 25 to 39 years [27] and so on.

Considering that the most frequently used age range of young persons in Korean literature is 20–39 years and that the age range used in the Korea Housing Survey 2019 is 20–34 years [46], young persons in this study were defined as persons aged 20 to 39 years old. Adult children in this study had the same age ranges as young persons.

3. Methods

3.1. Instruments

A questionnaire was developed by the researchers based on the Korea Housing Survey [28] in addition to previous studies related to young adults' housing situation in Korea [16,40,47]. The initial questionnaire was reviewed by two housing professionals in colleges located in Seoul and Busan in order to assure content validity, and was then revised accordingly. The final questionnaire was built to fit an online survey format by a survey company.

3.2. Sampling

The targets of the survey were young renters aged between 20 and 39 years who were living independently from their family or relatives. The original sample size was 500 and the specific sampling conditions were as follows:

- Nationality: South Korea
- Age: 20–39 years old (birth years: 1982–2001)
- Current residential type: Living separately from parent(s), sibling(s) or relative(s)
- Marital status: Never married
- Whether or not a student: Non-student
- Current tenure type: Jeonse renters, monthly renters
- Residential location: Seoul (30%), Incheon and Gyeonggi-do (40%), non-CR metropolitan cities (30%).

In 2020, residents with foreign nationality comprised of only 3.3% of the total population in Korea [53]. In this study, young residents with foreign nationality were excluded from this study's target population in order to minimize the complexity stemming from different cultural and housing backgrounds and their level of understanding of the Korean language. Married individuals and students were also excluded from this study's target population, as their financial situation may differ from unmarried individuals and/or non-student young adults [17].

As this study focused on the housing cost burdens of young renters, the residential locations were limited to the CR (Seoul, Incheon, Gyeonggi-do), and the five non-CR metropolitan cities (Busan, Daegu, Gwangju, Daejeon, Ulsan) which were known to have a greater proportion of young adults compared to the rest of the area's population and higher rental costs than other non-CR "Do" areas [15,46]. According to the Population Census of Korea 2020, the population aged between 20 and 39 years with Korea nationality measured at 13,243,592, and 73.1% of them lived in the area of study: the CR and non-CR metropolitan cities (Table 4). The number of young adults aged between 20 and 39 years and living in the study areas measured at 9,677,985, and 29.2% of them were in Seoul, 44.6% in Incheon and Gyeonggi-do and 26.2% in non-CR metropolitan cities. Considering the census distribution, this study's sampling was designed to be concentrated at 30% in Seoul, 40% in Incheon and Gyeonggi-do and 30% in non-CR metropolitan cities. Figure 1 shows a map of the study areas.

Table 4. Population aged between 20 and 39 years old with Korean nationality by area (2019).

Area	Population Aged 20 to 39 Years Old with Korean Nationality [A]	A/B × 100 (%)	A/C × 100 (%)
Study area			
Seoul	2,825,962	29.2	21.3
Incheon & Gyeonggi-do	4,319,890	44.6	32.6
Non-CR metropolitan cities [1]	2,523,133	26.2	19.1
Subtotal [B]	9,677,985	100.0	73.1
Other	3,565,607	-	26.9
TOTAL [C]	13,243,592	-	100.0

Source: Calculated from the Population Census of Korea 2020 (population section, complete enumeration part) data obtained from Korean Statistical Information System (KOSIS) [53] [1] Busan, Daegu, Gwangju, Daejeon, Ulsan.

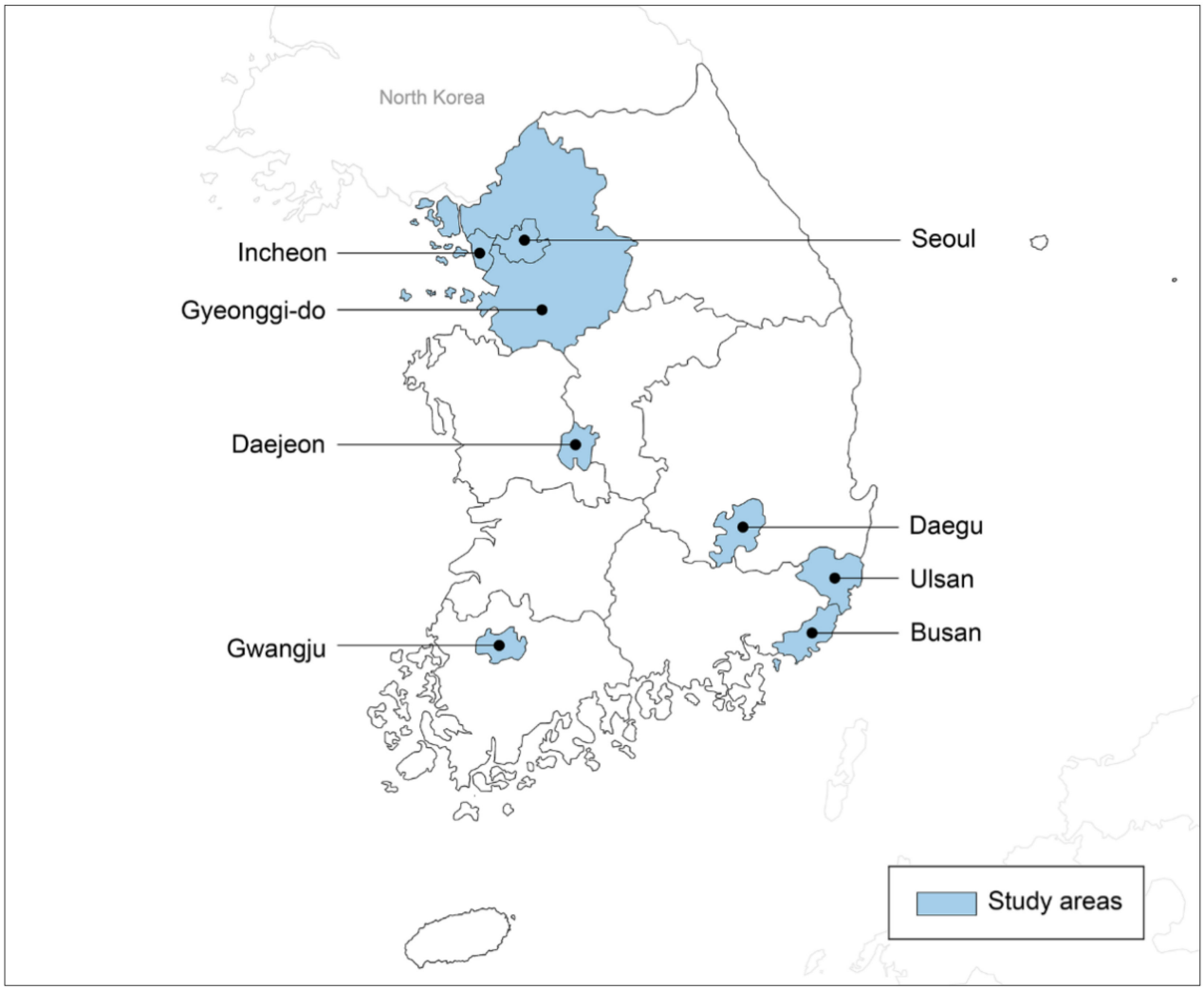

Figure 1. Study areas in South Korea.

3.3. Data Collection and Analysis

The data were collected from February 25 to March 8, 2021, using the company's own panel dataset. When respondents first accessed the on-line survey, they were provided with a page with an informed consent statement including survey purpose; voluntariness, bene-

fits and risks of participation; and confidentiality of the data collection. Only respondents agreeing to the consent statement could proceed to participate in the survey.

As a result, 500 valid responses were collected as planned. In terms of the frequency of tenure and rental types, only 2.4% (12 cases) had housing types other than Jeonse or monthly rentals with deposit, and 20.6% (103 cases) lived in public rental housing (Table 5). As this study focused on housing expenses, it was decided to exclude the 115 cases who had tenure types other than Jeonse or monthly rentals with deposit or who lived in public rental housing from further data analysis, mainly in order to minimize complication. As a result, the responses from 385 Jeonse renters and monthly renters with deposit living in private rental units were analyzed.

Table 5. Tenure and housing type of all respondents.

Item	*n*	%
TOTAL	500	100.0
Tenure type		
Jeonse renter	223	44.6
Monthly renter with deposit	265	53.0
Other [1]	12	2.4
Housing type		
Public rental housing	103	20.6
Private rental housing	397	79.4

[1] Monthly renter without deposit, yearly, weekly and daily renter, etc.

The data analysis focused on (1) situations of parental support to pay adult children's housing costs, (2) influences on parental support for current housing expenses, (3) young renters' perception of housing cost burdens and (4) influences on the perceived housing cost burdens. For the data analysis, descriptive statistics, a discriminant analysis and regression analyses were used. A discriminant analysis, similar to a logistic regression analysis, is a statistical technique used to predict group membership of each subject when the dependent variable is nonmetric (two or more groups) and the independent variables are metric [54]. A regression analysis is a technique to examine the relationship between a single dependent variable and a combination of independent variables [54]. IBM SPSS 25.0 was used throughout the entire data analysis.

4. Findings

4.1. Overview of Subjects

4.1.1. Socio-Demographic and Housing Characteristics

Among the 385 subjects, 52.7% were males and 74.5% were in their 30s, and the average age was 32.5 years. Over 90% reported having full- or part-time jobs, and 91.2% had college degrees or higher educational attainments. More than 90% were found to live alone (Tables 6–8).

Average monthly income was approximately 2,788,800 Korean Wons (KRWs), excluding the four subjects who reported having zero (0) income. When applying a currency exchange rate where 1 USD is equal to approximately 1150 KRW, 2,788,800 KRW can be converted into approximately 2425 USD. In the research report from the Korea Housing Survey 2019 [28], monthly household income was categorized into three levels: (1) "Lower level" referring to the bottom 40% income level (under 2,500,000 KRW/month); (2) "mid-level" referring to income in the fifth to seventh income deciles (2,500,000 to 4,649,000 KRW/month); and (3) "higher level" referring to the top 20% income level (4,650,000 KRW/month or over). The income used in the research report of Korea Housing Survey 2019 looked at household income, whereas this study surveyed personal income. However, as 90.9% of the subjects were single-person households, it was acceptable to adopt the income level categories from the Korea Housing Survey 2019 report in this study. As a result, it was

found that 40.4% of the subjects were classified to have a lower level income, and 54.0% had a mid-level income.

Table 6. Socio-demographic characteristics.

Item	*n*	%
TOTAL	385	100.0
Gender		
Male	203	52.7
Female	182	47.3
Age		
20–29 years	98	25.5
30–39 years	287	74.5
Current status		
Full-time employee (salary men, freelancers, etc.) or self-employer	341	88.6
Part-time employee	7	1.8
Unemployed	37	9.6
Educational attainment		
High school diploma or lower	34	8.8
degree or higher	351	91.2
Location		
Seoul	119	30.9
Incheon & Gyeonggi-do	150	39.0
Non-CR metropolitan cities	116	30.1
Household size		
Single person	350	90.9
Two persons+	35	9.1

Table 7. Age and monthly income.

Item	*n*	Mean	SD	Min.	Max
Age (years)	385	32.7	3.92	26	39
Monthly income (1000 Korean Won (KRW))					
All subjects	385	2759.9	1177.19	0	9900
Excluding 4 subjects with zero (0) income	381	2788.8	11486.3	200	9900

Table 8. Income levels.

Income Level	*n*	%
Lower level (0–2,500,000 KRW/month)	155	40.3
Mid-level (2,500,000–4,649,000 KRW/month)	208	54.0
Higher level (4,650,000 KRW/month+)	22	5.7
TOTAL	385	100.0

Note. Income level follows the income level categories used in research report of the Korea Housing Survey 2019 (p. 52, Table III-3) [28].

4.1.2. Housing Characteristics

As for current tenure types, 51.7% of the respondents were monthly renters with deposits and 48.3% were Jeonse renters (Table 9). The average rental deposit of current housing units was 81,439,500 KRW, widely ranging from 500,000 to 500,000,000 KRW. The average of monthly cash expenses, including monthly cash rent for monthly renters, monthly loan repayment for rental expenses and other housing expenses such as maintenance fees or utility bills was around 307,2000 KRW. Housing costs by tenure types were summarized in Table 10. Jeonse renters paid much higher amounts for rental deposits and smaller amounts for monthly cash expenses than monthly renters since they do not have monthly cash rent. On average, the Jeonse deposit was 4.2 times the subject's annual income, and the deposit of monthly renters was 1.3 times the subject's annual income. Among monthly renters, there were subjects whose monthly cash housing expenses were 255% of their monthly income. These results suggest that many young adults actually cannot afford to pay for their own rental expenses by preparing a deposit on their own or through their income alone without any external help including supports from their parents.

Table 9. Tenure types.

Type	*n*	%
Jeonse renter	186	48.3
Monthly renter with deposit	199	51.7
TOTAL	385	100.0

4.1.3. Housing Experiences

As for the experience of independent living, 41.8% reported that it had been five years or more since respondents first moved out from their parents' home (Table 11). The most frequently cited reason for choosing to live independently from their parents was due to the distance from their school or work or preparation for their job (63.6%), followed by a personal preference for independent living (26.5%). More than 95% of the respondents experienced residential moves since their first independent residences, and 44.1% were found to have moved three times or more.

4.2. Parental Supports

4.2.1. The Experience of Parental Support since First Independent Living Situation

Among the subjects, 167 respondents (43.4%) had experienced receiving financial support from their parents to pay for their housing costs since their first independent living situation. The most frequent purpose of receiving parental support was to pay the lump sum deposit (Tables 12 and 13). Among those who received parental support, nearly 40% received parental support for two years or more, and more than one third received 30,000,000 KRW or more in total accumulation (Table 14). Furthermore, 27.6% reported that they expected additional support from parents for a longer period of time (Table 15).

Table 10. Housing costs by tenure types.

Item	*n*	Mean	SD	Min.	Max
Jeonse renter					
Rental deposit (1000 KRW)	186	128,562.9	85,684.53	30,000	500,000
Monthly cash housing expenses (1000 KRW) [1]	186	123.6	186.77	0	1250
Rental deposit/annual income (times) [2]	183	4.2	4.04	0.4	41.7
Monthly cash housing expenses/ monthly income × 100 (%) [2]	183	5.0	8.91	0.0	70.0
Monthly renter with deposit					
Rental deposit (1000 KRW)	199	37,394.5	48,127.42	500	301,000
Monthly cash housing expenses (1000 KRW) [1]	199	478.9	266.00	50	2550
Rental deposit/annual income (times) [2]	198	1.3	1.82	0.0	12.54
Monthly cash housing expenses/ monthly income ×100 (%) [2]	198	21.6	21.73	0.9	255.0
All subjects					
Rental deposit (1000 KRW)	385	81,439.5	82,537.00	500	500,000
Monthly cash housing expenses (1000 KRW) [1]	385	307.2	291.37	0	2,550
Rental deposit/annual income (times) [2]	381	2.7	2.40	0.0	41.7
Monthly cash housing expenses/ monthly income × 100 (%) [2]	381	13.6	18.7	0.0	255.0

[1] Monthly cash rent, monthly loan repayment for rental expenses, other housing expenses (maintenance fees, utility bills, etc.). [2] Statistics excluding respondents with zero (0) income.

Table 11. Characteristics of the experience of independent living.

Item	*n*	%
TOTAL	385	100.0
Length of independent living		
Less than 2 years	97	25.2
Less than 5 years	127	33.0
Less than 10 years	91	23.6
10 years+	70	18.2
Main reason of first independent living		
Distance from school, work or job preparation	245	63.6
Wanting to live alone	102	26.5
Family reasons (e.g., move or death of family members)	23	6.0
Parents' recommendation	13	3.4
Other	2	0.5
Residential moves since first independent residence		
Never moved	18	4.7
1–2 times	197	51.2
3–5 times	143	37.1
6 times+	27	7.0

Table 12. The purposes of parental support since first independent living situation.

Purpose	*n*	%
Rental deposit	93	55.7
Monthly cash rent	44	26.3
Maintenance fees and/or utility bills	13	7.8
Contract-related expenses	12	7.2
Monthly loan repayment for rental expenses (deposit, cash rent, etc.)	10	6.0
Dormitory fees	9	5.4

Note: Percentages presented are the valid percentages out of the 167 respondents who had received parental support to pay off their housing costs since their first independent living situation. As respondents were allowed to select all that applied, the sum of percentages exceeds 100.0.

Table 13. Top five combinations of parental support purposes since first independent living situation.

Combination	*n*	%
Rental deposit only	63	37.7
Monthly cash rent only	17	10.2
Rental deposit + monthly cash rent	13	7.8
Monthly loan repayment for rental expenses (deposit, cash rent, etc.) only	5	3.0
Rental deposit + maintenance fees and/or utility bills	3	1.8

Note: Percentages presented are the valid percentages out of the 167 respondents who had received parental supports to pay off their housing costs since their first independent living.

Table 14. Length and total amount supported by parents to pay housing expenses since first independent living situation.

Item	*n*	%
TOTAL	167	100.0
Length		
Less than 1 year	23	13.8
Less than 2 years	38	22.8
Less than 4 years	33	19.8
4 years+	32	19.2
Missing	42	25.1
Total amount		
Less than 10 million KRW	26	15.6
Less than 30 million KRW	42	25.1
Less than 50 million KRW	30	12.0
Less than 100 million KRW	20	12.0
100 million KRW+	17	10.2
Missing	42	25.1

Table 15. Expectations of additional parental support for housing expenses.

Length	*n*	%
No more supports needed	54	32.3
Less than 2 more years	20	12.0
Less than 4 more years	13	7.8
4 more years or longer	13	7.8
Missing	42	25.1
TOTAL	167	100.0

4.2.2. Parental Support for Current Housing Expenses

One hundred thirty-seven subjects (35.6%) were currently receiving financial support from their parents or using the funds that parents had already supplied in the past in order

to pay their current housing expenses, including 13 subjects who relied on their parents for their entire housing expenses (Table 16). The average proportion of parental support out of current housing expenses among the 137 subjects who were using parental funds measured at around 43.7% (SD = 30.27).

Table 16. Proportion of parental support among current housing expenses.

Proportion	*n*	%
0% (Not used)	248	64.4
1 to 24%	50	13.0
25 to 49%	27	7.0
50 to 74%	31	8.1
75 to 99%	16	4.2
100%	13	3.4
Total	385	100.0

4.2.3. Influences on Parental Support

To explore the influences on whether young renters received parental support to pay current housing expenses, a discriminant analysis (stepwise method) was adopted. The dependent variable was the "receipt of parental support (not received = 0, received = 1)" and the independent variables were socio-demographic characteristics (gender, age, educational attainments, monthly income, residential location) and housing characteristics (tenure type, rental deposit, monthly cash housing expenses). Table 17 contains further details on the independent variables used.

Table 17. Independent variables used in discriminant analysis.

Variable	Type	Measurement
Gender: Female	Dummy	Female = 1, male = 0
Age	Continuous	Unit: years
Education	Dummy	College degree or higher = 1, High school diploma or lower = 0
Monthly income	Continuous	Unit: 1000 KRW/month
Location: Seoul	Dummy	Seoul = 1, other = 0
Location: Incheon & Gyeonggi-do	Dummy	Incheon & Gyeonggi-do = 1, other = 0
Tenure: Jeonse	Dummy	Jeonse renter = 1, monthly renter with deposit = 0
Rental deposit	Continuous	Unit: 1000 KRW
Monthly cash housing expenses	Continuous	Unit: 1000 KRW/month

For the results, a linear combination of age, monthly income, residential location (Seoul, Incheon and Gyeonggi-do) and rental deposit amount could predict whether a young renter had received parental support to pay for current housing expenses with 66.5% accuracy (Tables 18 and 19). To see the standardized discriminant coefficients of the discriminant function and group centroids, younger subjects, subjects with lower income, subjects living in Seoul, Incheon/Gyeonggi-do and subjects with a greater rental deposit showed a greater tendency to have received parental support to pay for their current housing expenses. Among the independent variables included in the final-stage discriminant model, living in Seoul and the rental deposit size were found to be the most influential when looking at the standardized discriminant coefficients. Although this discriminant model showed 66.5% classification accuracy, this model was less effective

in predicting young renters who received parental support (30.7%) than those received parental support (86.3%). Figure 2 summarizes the final-step discriminant model.

Table 18. Final-step discriminant model: Model summary.

Item	Value
N	385
Model fit	
Box's M (F)	1.288 (p = 0.200)
Eigenvalue	0.127
Canonical correlation	0.335
Wilk's lambda	0.888
Chi-square	45.377 (p = 0.000)
Group centroid	
"Not received" group	−0.264
"Received" group	0.478
Classification accuracy (cross-validated)	
"Not received" group	86.3%
"Received" group	30.7%
Total	66.5%

Note: Only the results of the final-step model of a stepwise method are presented.

Table 19. Final-step discriminant model: Coefficients.

Variable	Standardized Canonical Discriminant Function Coefficients	Fisher's Classification Function Coefficients	
		Not Received	Received
Age	−0.399	2.153	2.077
Monthly income	−0.381	0.009	0.006
Location: Seoul	0.683	2.469	3.580
Location: Incheon & Gyeonggi-do	0.388	3.518	4.106
Rental deposit	0.652	-5.952×10^{-6}	5.395×10^{-5}
(Constant)		−38.260	−36.846

Note: The dependent variable was the receiving of parental support to pay current housing expenses (not received, received). Refer to Table 17 for the description of the independent variables. Only the results of the final-step model using the stepwise method are presented.

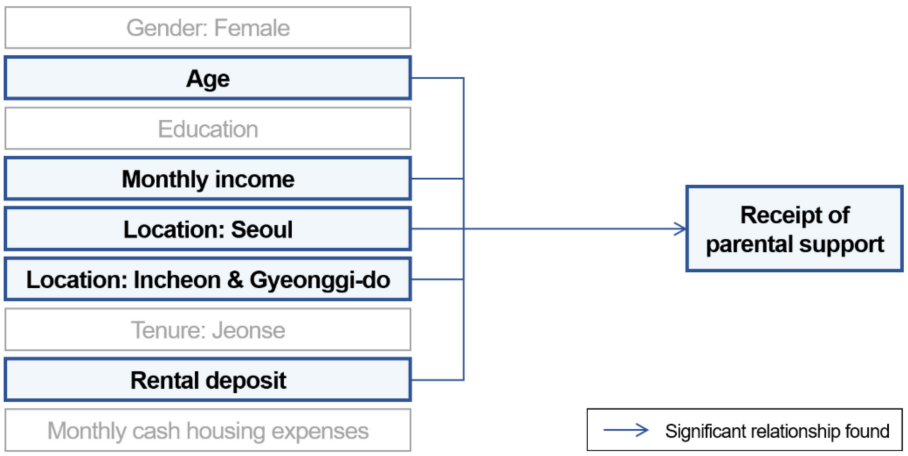

Figure 2. Summary of final-step discriminant model.

4.3. Perceived Housing Cost Burdens

4.3.1. Perception of Burdens

The perception of current housing cost burdens was measured on a 6-point scale ranging from "not burdensome at all (1)" to "very burdensome (6)". As a result, the average perceived housing cost burden score measured at 4.36 (SD = 1.23), which indicated that subjects perceived their current housing costs to be burdensome on average.

4.3.2. Influences on Perceived Housing Cost Burdens

The influence of socio-demographic and housing characteristics on perceived housing cost burdens were examined using a multiple regression analysis with a stepwise method. The dependent variable was perceived housing cost burden measured on a 6-point scale (not burdensome at all (1)—very burdensome (6)), and the independent variables were the same as those used in previous discriminant analyses (refer to Table 17). As a result, a linear combination of monthly cash rental expenses, gender and rental deposit was found to explain 5.8% of the total variance of the perceived housing cost burdens of young renters (Tables 20 and 21). When looking at the standardized coefficients, the amount of monthly cash housing expenses showed the strongest influence on perceived housing cost burdens. No collinearity problems were observed when looking at the tolerances and VIFs of the variables used in the final-stage regression model. The final-step regression model is summarized in Figure 3.

Table 20. Final-step regression model: Model fit.

Item	Value
ANOVA (F)	8.846 (p = 0.000)
R-square	0.065
Adjusted R-square	0.058

Note: Only results of final-step model of a stepwise method are presented.

Table 21. Final-step regression model: Coefficients.

Variable	Coefficients		t (p)	Collinearity	
	Unstandardized	Standardized		Tolerance	VIF
(Constant)	3.772		28.519 (0.000)		
Monthly cash housing expenses	0.009	0.205	3.987 (0.000)	0.931	1.074
Gender: Female	0.349	0.142	2.874 (0.004)	1.000	1.000
Rental deposit	1.956×10^{-5}	0.132	2.565 (0.011)	0.931	1.074

Note: The dependent variable was perceived housing cost burdens measured on a 6-point scale: "Not burdensome at all (1)" to "very burdensome (6)". Refer to Table 17 for descriptions of the independent variables. Only the results of the final-step model using a stepwise method are presented.

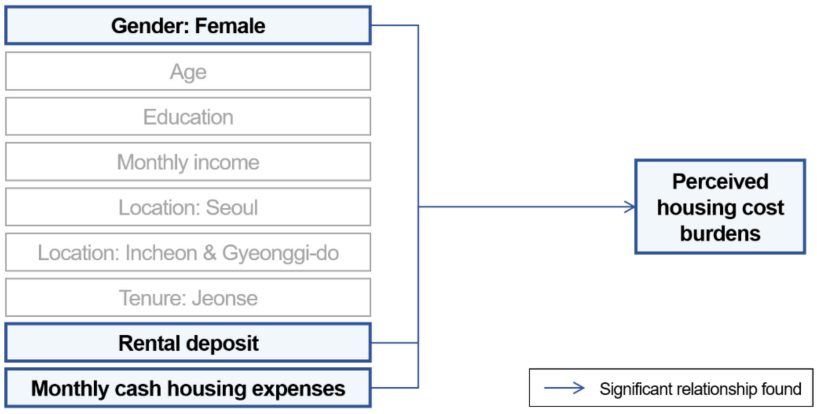

Figure 3. Summary of the final-step regression model.

4.3.3. Influence of Parental Support on Perceived Housing Cost Burdens

Using a hierarchical regression analysis, the influence of parental support (not received, received) on perceived housing costs burdens was examined with seven variables. These were found to have a significant influence on either the perceived housing cost burdens or the receiving of parental support through a previous discriminant analysis and linear regression analysis (gender: female, age, monthly income, location: Seoul, location: Incheon and Gyeonggi-do, rental deposit, monthly cash housing expenses controlled). As a result, the receiving of parental support did not show any significant influence on perceived housing cost burden at the $p < 0.05$ level when gender, age, residential location and housing costs were controlled for (p of F-change= 0.132).

5. Discussion

This study explored parental support and the perceived housing cost burdens of young renters residing in private rental housing independent from their parents through an online questionnaire survey. The major findings and implications are as follows.

Firstly, in terms of housing expenses, many young renters were found to be financially dependent on their parents. More than 40% of the subjects had experienced receiving financial support from their parents in order to pay housing expenses since their first independent living experience, and more than one third were still receiving parental support in order to pay current housing expenses. There were subjects whose parents paid the entire sum of housing expenses for their current housing. Furthermore, more than one third of the subjects who had experiences of parental support since their first independent living situation showed an expectation for additional parental support in the future. In terms of the ratio of housing costs to income as discussed above, it would be desirable to interpret such economic dependence not only as the parent-dependent propensity of young people, but also as an inevitable phenomenon due to the reality of the rental housing market in South Korea. This reality requires a level of deposit and rent that young people cannot pay on their own, and includes the current difficult economic situation of young people due to the economic recession and consistent job shortages.

Secondly, through a series of discriminant analyses and regression analyses, the amount of rental deposit was found to have a significant influence on both the receiving of parental support and perceived housing cost burdens, while monthly housing expenses, including monthly cash rent, showed a significant influence only on perceived housing cost burdens. In detail, the most influential feature of the receiving of parental support were the rental deposit that renters pay at the beginning of the lease, while the monthly cash housing expenses were the most influential on the perception of housing cost burdens. This is because young people who have fewer opportunities to accumulate assets than the older generation were more likely to receive support from their parents, as it is difficult to pay a large deposit on their own; however, housing costs, such as monthly rental expenses and management costs, which are typically paid every month, rather than the deposit they pay for their lease contracts, can be interpreted as having a more practical impact on their level of awareness of the housing cost burden.

Thirdly, older subjects or subjects with a higher income were found to be less dependent on their parents to pay current housing expenses. The results of this study can be interpreted in relation to the results of previous studies that reported that the dependence on parents for housing expenses of the rental households of freshmen in society decreased as time elapsed after entering society [21]. This is because young people who are relatively old or earn more income can be seen as having more robust economic strength as more time elapsed since they first began working. These results suggest that unlike housing welfare support for the elderly and disabled, which are difficult to improve over time, if the economic burden on young people and their parents can be reduced through adequate housing support in the early days of their independence, it is possible for them to easily get out of this supply as time passes and their economic strength is reinforced.

Finally, it was found that parents' support when adjusting for socio-demographic and residential characteristics had no significant impact on the renter's perception of their housing cost burden. Taken together with the previous results, the financial support of parents for adult children may play a role in enabling Jeonse and monthly rental contracts themselves, but the actual role of easing the burden of housing expenses for young renters can be interpreted as insignificant overall.

6. Conclusions

The problem of housing costs for young people not only places a financial burden on young people themselves, but also affects their parents, hindering their preparation for retirement and causing various social conflicts for both the short and long run. To summarize the above research results, the supply of rental housing with low deposits must be further expanded in order to reduce the burden of housing costs and parental support for their children, and to ultimately ensure social stability and sustainability. However, it is difficult to expect housing stability for young people in the housing market as deposits in the current general housing market are steadily increasing over time, and this trend shows no sign of reversing. Therefore, it is necessary to discuss ways to supplement the housing welfare system, such as expanding the supply of low-cost public rental housing such as the Haeng-bok House or expanding support for the housing expenses for young households. Currently, the government's support policies to solve the housing problems of young people, such as the expansion of public rental housing and the development of financial products only for young people, are gradually expanding over time, but there are many cases where young people cannot use them properly due to a lack of supply or insufficient promotion of the system. Therefore, it is necessary to respond more actively to young people's housing problems by strengthening the customized education and promotion programs for young people, along with the expansion of young renters' housing support policies in the future.

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Institutional Review Board Statement: Not applicable.

Informed Consent Statement: You are invited to participate in the survey titled "Housing Situation of Young Renters." The purpose of this survey is to obtain information for policy and program development to improve young adults' housing situation. When completing the survey, you will be given point incentives from the survey company. There are no foreseeable risks involved in participating in this study. All responses will be collected confidentially without collecting any personal information to identify you, and data will be kept securely by the researchers and used for research purpose only. By clicking "I agree" button below, you are assumed to agree to participate in the survey.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the sensitivity of the data.

Conflicts of Interest: The authors declare no conflict of interest. The National Research Foundation of Korea, the funding agency, had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript, or in the decision to publish the results.

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Housing Policy: An Analysis of Public Housing Policy Strategies for Low-Income Earners in Nigeria

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Abstract: This article evaluates the Global South housing policy for low-income earners by utilising the Nigerian example to analyse public housing policy strategies used to provide housing to low-income earners. The materials employed in the study were housing policy programme documents provided by various ministries that are linked to housing between 1991 and 2020. The housing policy documents were subjected to qualitative content and thematic analysis. The analysis of the selected housing policy documents showed seven key policy strategies that are intended to strengthen affordable housing development. These strategic themes are funds, schemes, governments, implementation, development, land, and rurality. The findings indicated that the existence of housing policy strategical themes does not translate to affordable housing development and housing affordability for low-income earners, though the effective activation and implementation of strategical themes will promote affordable housing development.

Keywords: housing policy; Nigeria; strategies; housing tenure; affordable housing; low-income earners; sustainability

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1. Introduction

Housing is a multi-faceted issue and fundamental to the well-being, survival, and health of human beings. A house may be spoken of in relation to people obtaining and having access to a house or being housed [1], and the development of housing units plays a major role in providing accommodation or space for different uses, regardless of income, class, and societal status. Conversely, the role played by governments in housing provision varies across countries in terms of the level of interventions and the kind of intervention made [2], through policies, programmes, or schemes. An ineffective housing policy for low-income households can lead to housing shortages and unaffordable housing.

In general, housing policies and programmes are aimed at promoting housing affordability for low- and middle-income households [3–5] and at national and regional levels of governments. An adequate housing policy has different intervention mechanisms and strategies that can be utilised to provide housing to low-income households. Thus, these strategies and intervention mechanisms often take different forms, including regulation, subsidisation, and accountability, in the definition of issues of non-intervention, information, and direct provision [6]. These different policy strategies and mechanisms can be employed as solutions intended to solve housing shortage issues amongst low-income earners. Subsequently, using effective policy strategies and mechanisms might help in reducing a quantitative housing deficiency where housing is only used as cover [7].

Therefore, the existence of an ineffective housing policy strategy can lead to housing shortages, slum spread, and unaffordable housing, which can be major obstacles to the well-being of low-income earners [8]. It hinders their access to affordable housing and has severe social effects and negative impacts on economic development [9]. An effective

implementation of housing policy strategies provides affordable housing to low-income earners and improves their living standards [10]. The housing policy strategies in the Global South have been criticised for not making housing accessible, available, adequate, and affordable to low-income earners. For example, scholars have noted that the present housing policy in the Global South has failed to provide affordable housing to low-income earners [11–16]. Furthermore, other scholars have also noted that most governments in the Global South are directing efforts towards solving these housing shortage problems [17–19].

An effective housing policy is not essentially about the nature of housing alone, it also entails the link between housing as a consumption good and housing as an economic good with a market value [20]. In a similar vein, Della Spina et al. [21] noted that social housing (SH) initiatives are an opportunity to pursue sustainability goals. Thus, social housing policies ought to be tailored to the economic opportunities, construction processes, geographic region, cultural context, and material needs of a certain society [22]. This is in line with the concept of sustainability. According to the Brundtland report (World Commission on Environment and Development, WCED, 1987), sustainability is defined as the long-term balance between the environment, economic growth, and the social aspect to meet the needs of a society. It is also essential in environmental preservation and the quality of urban development [23]. For example, environmental sustainability promotes ecologically oriented lifestyles and social cohesion and discourages the exclusion that has created slum neighborhoods.

Sustainability is a multifaceted concept that integrates economic, environmental, and social aspects. Therefore, an effective housing policy that is in line with the concept of sustainability must be centered primarily on policies related to regional and urban development, governance, finance, and taxation [24]. In the context of housing, housing policies based on sustainability criteria must first and foremost meet the basic housing needs. However, connecting housing policies to sustainability involves actions that integrate the overall quality of living spaces, social aspects, and spatial aspects [22]. In other words, connecting housing policies to sustainability involves integrating sustainability objectives with housing policy to meet the housing needs of a society. Thus, ineffective implementation of housing policy and the lack of an integrated sustainability concept in urban planning strategies may make housing policies unsustainable and, as such, result in a housing shortage with severe social effects and negative impacts on economic development [9].

UN-HABITAT has emphasised that the housing shortage in the Global South is the manifestation of failures in housing policies, implementation systems, legislation, and national urban policies [25–27]. Ezennia and Hoskara [16] have also attributed the housing shortage to housing supply not having been able to meet housing demand. They emphasised that the issue of affordable housing supply centers on shortage and poor distribution in most developing countries. This is in line with an earlier study by Makinde [7], which noted that housing demand in Nigeria outweigh housing supply. However, in Nigeria, the government forms the only legal entity empowered to make housing policies and provides housing to low-income households in terms of tenant and place or project base subsidies.

The government of Nigeria provides national level policy guidelines and legislation for urban planning and housing development. Through the constitution, all tiers of government, both state and local, need to implement and adopt the national housing policy to pursue public partnership that could help the actualization of their housing objectives [28]. To deliver on housing policy objectives, various strategies have been used by governments, e.g., tenant-based and place-based programmes in Finland (see [5,29]) and housing vouchers in the US [30] and in the Global South. For example, in Nigeria, the federal and state governments have constructed low-cost estates for low-income earners [27,31,32]. This led to the massive construction of housing units, where the basic objective was to provide residential accommodation in the 23 local government areas (LGAs) of the state. The Nigeria government also made a paradigm change from direct provision to enablement policy, as promoted by the United Nations since 1991; however, despite the change, the

housing problem remains a major challenge, with many urban residents forced to live in poor housing conditions and slums.

That having been said, there has been much discussion of the issues relating to a Nigerian affordable housing policy [16,32–39]. Presently, no empirical research has explored the Nigerian housing policy strategies utilised to provide housing to low-income earners in Nigeria using a qualitative content and thematic analysis of housing policy documents. Previous research has not answered the research questions which need to be addressed to provide understanding of the strategies used in the promotion of affordable housing. To fill this gap, the aim of this article is to study Global South housing policies, using the Nigerian example to analyse public housing policy strategies utilised to provide affordable housing to low-income earners. This article does not focus on the rental-based type of public housing. Instead, the focus is on the purchase ownership systems of public housing. (In this type of housing scheme, the houses are sold at subsidised or below-market housing rates to middle- and low-income earners in a society, e.g., low-cost housing scheme. For example, in Finland affordable housing or social housing is rent-based (place or tenant), while affordable housing in Nigeria takes the form of purchase ownership systems through a low-cost housing scheme.

First, this article contributes to an international discussion of the issue of housing policy to critically address the role of policy in addressing the instability faced by housing systems across the world [40,41]. This article also makes an input to the international discussion on housing development for safe and affordable housing as described by the United Nations' principles for the Sustainable Development Goal 11 target. Secondly, this article contributes to understanding of housing policy strategies for the development of affordable housing [42] and also contributes to the discussion and understanding with concrete examples of housing policy strategy development in the Global South using the Nigerian example. The article presents a method to categorise the variety of housing policy strategies to deepen theoretical understanding of housing policy strategies. Thirdly, this article contributes to the discussion of the issues of housing policy formulation and implementation in a developing countries context [27,37,43–45]. Subsequently, the results of this article can be utilised by decision makers to improve the housing conditions of low-income earners through housing policy formulations and effective implementations aimed at the provision of affordable and decent housing. This article answers the following research question:

RQ1. *What are the strategic themes used in the housing policy aimed at providing housing to low-income earners in Nigeria*?

In this article, we explain the identified strategical themes in the housing policy implemented by the Nigerian government to provide affordable housing. However, it is essential to specify that the question identified strategical themes in housing policies and initiatives at the national level. The reasons for using the Nigerian example as a case study is explained in the Materials and Methods section (Section 4) via the Nigerian housing policy context. Moreover, this paper does not focus on middle-income earners but rather focuses exclusively on low-income earners. To this end, this article used a qualitative document analysis of housing policy papers collected from various ministries that are linked to housing in the years 1991–2020 and housing programmes data from the Rivers State Ministry of Housing and Urban Development, the Department of Urban and Regional Planning, the Federal Ministry of Power, Works, and Housing. The remainder of the paper is organised as follows. Section 2 describes a conceptual framework for housing policy factors that influence success and failure. Section 3 reviews the Nigerian housing policy context and details the materials and methods used to collect and analyse the data. Section 4 presents the results of the study. Section 5 discusses the results of the analysis and Section 6 elaborates on their significance within the larger context of housing policy development and provides areas for future research.

2. Housing Policy Factors of Success and Failure: Conceptual Framework

This section provides a framework for understanding the factors of success and failure in public housing. Housing policy strategies that are targeted at low-income groups must be analysed as a multifaceted set of policy strategies established in different economic, institutional, and social-environmental contexts across the world. In understanding housing policy strategies in order to provide affordable housing for low-income earners, scholars and policy makers have come up with different types of successful housing policy strategies [46]. For example, land policy promotes the provision of housing in Germany, Belgium, and the Netherlands [47]. In addition, organization, urban planning, land allocation, and financial subsidies are the policy tools used to provide successful affordable housing supply in Berlin, Hamburg, Stockholm, and Gothenburg [48]. However, other success factors have also been reported by scholars, such as affordability, good governance, adequate funding, economic design, efficient management, appropriate technology, and effective legal and legislative frameworks [49]. Mukhtar et al. suggested that a proper structure of housing finance can lead to the improvement of affordable housing delivery [18], while others have emphasised that economic, social, and environmental and political factors promote successful provision of sustainable affordable housing [50,51]. Furthermore, Saidu and Yeom [39] emphasised that the process of assessing success criteria to achieve sustainable housing models from the perspectives of households is to be made through accessibility, adaptability, utility, technology, community, affordability, and acceptability.

However, several critical factors are reported to be responsible for inadequate housing delivery, and scholars have mentioned unsold properties and abandoned houses due to housing choice [16,52,53]. The inability of housing supply to satisfy demand is linked to shortages of affordable housing [16]. Other major constraints on the delivery of affordable housing include issues related to housing finance, lack of access to land with secure tenure, the high cost of building materials, limited skilled manpower, poor infrastructural conditions, and lack of maintenance culture [18]. Additionally, Trangkanont and Charoenngam [54] have emphasised that lack of housing finance, policies, administration and regulations and their ineffective implementation, as well as defective legal and institutional frameworks are critical factors of failure in public–private partnerships in low-income housing programmes.

In the analysis of the reviewed text, the conceptual framework highlighted various strategic issues relating to achieving successful affordable housing. These strategic issues are linked to social, economic, and political issues. For instance, social factors are concerned with issues of good housing location, accessibility, cultural utilities, design and flexibility, and the involvement of low-income earners. The economic issues center around promoting the economic environment and influencing access to funds and affordability in financing housing delivery. Political issues are concerned with government modes of support and the provision of an enabling environment through land access and provision, secure land tenure, infrastructural development, skill development, and a good regulatory and legal framework, in addition to government support for local building material production. For example, the government can provide land and infrastructure to make possible the delivery of affordable housing to low-income earners. Finally, the success of any housing policy strategies or programmes depends on how effectively these influencing factors are implemented and how the policymakers, in designing the housing policy strategies, understand the interrelation of these factors.

3. Housing Policy Interventions to Increase Housing Supply in Nigeria

Housing policy programmes in Nigeria date back to the colonial era, in which housing units were built for the expatriate staff and other selected workers of Nigerian origin [18]. Since then, housing programmes and schemes have been regularly addressed in the national housing policies, with newer housing schemes initiated and more housing funds allocated for the development of housing. Different housing policies have been implemented in some countries in the Global South, including Nigeria, that are aimed at reducing housing

shortages among low-income earners [18,19,40]. For example, the Nigerian government has adopted and implemented various housing policies and programmes in support of affordable housing that have focused on producing houses for low- and middle-income earners since the country gained independence, between 1960–1990, and from 1991 to the present day [27,32,55]. According to Aliu et al. [27], these include the direct provision of low-cost housing (LCH) by the government, assisted self-help housing (ASH) by individuals, and site and service (SAS) housing, as provided by the Nigerian National housing policy of 1991 [27,56].

The housing policy objectives are implemented through programmes aimed at providing housing to low-income earners. The objective of these housing policy programmes is to provide affordable housing and meet the housing needs of low-income earners through federal, state, and local governmental low-cost housing programmes [32,35]. For example, the 1991 housing policy aimed at providing decent housing at an affordable cost by the year 2000. The failure of the state-led housing system to meet the low-income housing needs led to the formulation of a new housing policy in 2006 [15]; this was due to the housing policy's inability to meet its primary objectives [37].

The focal objectives of the 2006 housing policy were to allow the government and private sector to be the drivers in delivering affordable housing [15]. Despite these different housing policies, housing reforms, housing programmes, and strategies that have been implemented by the federal, state, and local governments in Nigeria [56,57] to meet the housing needs of low-income earners [32], a housing shortage has persisted in Nigeria. However, the Nigerian housing policy from the post-independence era, i.e., from 1960 onwards [31], aimed at meeting the housing needs of expatriate staff and other selected workers of Nigerian origin [14] and was subsequently utilised to provide housing to low-income earners through public housing provision [13]. According to Ibem and Amole [11], housing programmes in Nigeria are meant to enhance or improve the existing poor housing conditions of low-income persons.

Despite the policies, the Nigerian housing deficit currently stands at 17 million housing units, and only about 200,000 units are built annually [57]. The provision of housing by the government to low-income earners is seemingly impossible for now. To deliver on housing policy objectives, various strategies have been adopted by the government. For example, the federal and state governments have constructed low-cost estates for low-income earners [27]. However, in line with the housing policy objectives, the federal and Rivers State governments have constructed low-income housing units in Rivers State. The Rivers State government and the federal government of Nigeria have pursued partnerships aimed at housing the low-income earners in Rivers State. Moreover, Governor Odili's administration of Rivers State (1999–2007) recognised the shortage of residential accommodation in the entire state and the need to provide shelter (especially for low-income earners).

This led to a massive construction of housing units, and the basic approach was to provide residential accommodation in the 23 local government areas (LGAs) of the state. A total of 3142 two-bedroom flats were constructed in the 23 LGAs of the state as provided by the housing programme, out of which 1096 were executed to completion and allocated to the public by balloting. However, the outcomes of the federal and Rivers State government housing programmes are an example of failure of the strategy. For example, Table A1 presents the housing programme outcomes in Rivers State. Furthermore, the results provide a summary of public housing units built between 1972 and 2019 in Rivers State. The housing programme's intended outcomes indicate that a total number of 12,142 housing units were to be built in Rivers State, while only 3029 housing units (24.95%) of the predefined outcome were built and allocated. The housing objective has not been achieved, as the predefined outcome does not equate with the realised programme outcome. The number of realised units is much lower than the number of units indicated in the housing policy. Hence, the outcomes of these housing policy strategies have not yielded the desired result.

There has been a considerable amount of literature produced by various authors on housing policy programmes in Nigeria (see [7,16,27,35–38,58–60]). For example, Ikejio-

for [61] examined the housing policy in Nigeria with particular emphasis on public housing programmes. The study established that the provision of public housing failed to meet the public housing demand nationally as a result of bureaucratic mismanagement and unaffordability [38]. For instance, Iheme, Aribigbola [35,44] and Daniel and Hunt [26] attributed the failure of the public housing policy to its implementation processes. Ibimilua and Ibitoye [36] found the implementation process, scarcity of land, insufficient mortgages and finance for housing as the cause of housing policy failure. In addition, Iheme [35] and Ezennia and Hoskara [16] identified poor distribution, shortages, corruption and nepotism, and allocation processes as reasons for the failure of the government housing policy. Similarly, Ebekozien [62] found that housing demand was far higher than supply, and that the problem of affordable housing supply centers on shortage and poor distribution [16]. Furthermore, Aliu et al. [27], in a study on Lagos, Nigeria, identified cost and affordability, policy objective implementation, mortgage finance, and government–community conflicts as factors influencing public housing programme failure. The study also questioned the efficacy of housing programmes in developing countries as they have proven inefficient.

According to Adeshina and Idaeho [63], rapid urbanisation, long-term housing finance, bureaucracies in land acquisition, weak institutional frameworks, ineffective governmental programmes and policies, as well as problems associated with policy implementation in the Nigerian housing sector, are contributing factors to public housing programme failure in Nigeria. Other scholars have also identified issues related to the implementation, formulation, and execution of policies, ineffective housing finance, inadequate research and funding, shortages of skilled manpower, and insufficient infrastructural amenities [44,64], corruption and nepotism, security challenges, issues of political interference, ineffective project inspection, poor distribution and allocation, government policy structures [35], and weak institutional frameworks, as well as inappropriate legislation on land tenure system [37]. In other African countries, for example, Ghana, Ethiopia, Malawi, Kenya, Senegal, Algeria, and Togo, among others, housing affordability has also been a major problem experienced by low- and middle-income earners [10,28,65,66].

A great amount of research has been conducted on housing policy globally that has addressed the motivation and dynamics of housing policies, affordable housing policy frameworks, policy implementation and state policy models [45,67–74]. For, example, Fernandez and Martin [74] examined the effectiveness of affordable housing policy in Auckland, New Zealand by assessing the outcomes of a set of affordability policies to gain an idea of how much affordable housing these policies can deliver. The study established that the numerous parameterisations of the model demonstrate potential contradictions between policy goals. A study by Cai et al. [68] found that housing policy in terms of improving housing conditions remains uneven across China.

Similarly, Cia and Wu [70] examined factors affecting the implementation of affordable housing policies in China and the studies found intergovernmental support from the central government, city development strategies, implementation perceptions of local governments, and land supply as the factors that impact affordable housing programmes. In India, building regulations have been acknowledged as one of the barriers to affordable housing [69]. Sabela and Isike [71] investigated the effectiveness of existing housing delivery approaches used for human settlements in developed municipalities in South Africa. In addition, Balmer and Gerber [67] examined recent developments in Swiss housing policy and they found housing cooperatives to be a housing support instrument that agrees with the political spectrum. They emphasised that housing policy changes primarily focus on the supply side of housing.

Furthermore, housing affordability at the level of household and affordable housing stock is in decline for low-income renters and low-income homeowners in most countries of the world and in Australia [75] and the United States [76,77]. Regarding this issue of housing affordability, Hansson found that there is a severe shortage of housing in Germany and Sweden, but both governments have aimed at increasing housing supply using an approved multi-family housing model for the development of affordable housing [78].

However, understanding whether a housing policy is effective is also a pertinent practical issue, as the focus on affordable housing for middle- and low-income earners is a global problem and finding solutions to these challenges has constantly been an issue of public debate among academicians, governments, and international organizations [45,73,79].

Thus, the reviewed articles on housing policy in the Global South were linked to issues of finance, institutional and policy implementation, land, housing supply and shortage, and ineffective governmental programmes, while in the Global North the issues are linked to issues of housing supply, housing shortage, and housing policy support structures. Finally, Coupe [73] emphasised that the housing affordability crisis is a global crisis and that the concern for housing affordability is widespread across countries, the extent of these concerns depending significantly on each country´s context and on the particular subgroup and indicator analysed.

4. Materials and Methods

This article is focused on identifying strategical themes in efforts to promote the development of affordable housing for low-income earners in the Global South. By means of the Nigerian example, this article applies the qualitative content and thematic analysis method to identify key strategical themes emanating from the housing policy domain in Nigeria. The research data for this study consists of 11 policy documents, which were collected from various ministries associated with housing policy development. While six national policy documents and a report were retrieved from the websites of government ministries (e.g., https://worksandhousing.gov.ng/, accessed on 13 December 2021), the remaining four documents were retrieved from the e-portal of the Nigerian Investment Promotion Commission (www.nipc.gov.ng, accessed on 13 December 2021). Our criteria in the data collection were that the policy documents used in this study had to be published by the government on issues relating to public policy actions on housing provision and development. These documents are related to policies supporting housing developments in Nigeria between 1991 and 2020. These websites are utilised by the Nigerian government for publicly sharing information concerning policy development. The data gathering took place between January and February 2021. (See Appendix A, Table A2 for selected policy documents from various ministries.)

The collected data may not be the only form of data used in exploring housing policy issues, but these documents were the available options suitable for the analysis of housing policy strategies in the Nigerian policy context. The documents were evaluated in light of the research questions and, based on the evaluation, one document was removed from the dataset. The reason for choosing this period was related to the fact that these periods included both the military and the democratic governing systems. During the military regime in 1991–1999, the Nigerian military regime launched "housing for all" programmes as a response to the United Nations' demand for housing. The 1991 housing policy was a purely government-driven housing system aimed at providing decent housing for all at an affordable cost by the year 2000, which subsequently failed to produce the expected outcome. The failure of the government-driven housing system to meet low-income housing needs led to the formulation of a new housing policy in 2006. The focal objectives of the 2006 housing policy were to allow the government and private sector to act as the drivers to deliver affordable housing [15], which has continued until the present.

Data Analysis

The data analysis for the housing policy strategies followed a qualitative content and thematic analysis of the extracted housing policy documents. The main objective of this process was to gain a comprehensive understanding of the studied phenomena [80]. The analysis of the textual data involved a wide range of logical procedures [81], such as the reading, manual coding, sorting, and classification of the data (see Appendix A, Figure A1, Data selection process, classification, and analysis flow chart). In the first stage of the data analysis, the data was read to determine its relevance to the research question.

This was then followed by a re-reading of the data, with each description of the documents including sentences that addressed the research question. The analysis in the second stage was conducted by utilizing NVivo to see the theme associated with the housing data and to understand the frequencies of words and text in the data. The raw data was taken out to be manually coded in a Word document to compare what was originally shown in NVivo with the objective of identifying the real inspiration for the policy story. The third stage involved the sorting and categorisation of the data by classifying them into various thematic categories and by connecting the emergent themes for significant classification of housing policy strategies for low-income earners in Nigeria (see Appendix A, Figure A2, Word cloud of the most frequently used words in housing policy documents). These frequent themes were analysed by means of thematic analysis to provide the evidence for housing policy strategical themes for the low-income groups in our case study area. The fourth stage involved the exploration of the themes that resulted from the textual data. Eight themes appeared in the housing policy document material for analysis.

5. Results

This section is divided into two parts. The first describes housing policy strategy in the Nigerian context. The second part focuses on the description of the outcome of the housing policy programmes in the case of Rivers State. The analysis of the selected housing policy documents answered the questions of housing policy strategy for low-income earners in Nigeria. The analysis of the selected housing policy documents shows eight key policy strategies to strengthen housing development. These eight key strategies are funding schemes, housing schemes, governments, implementation, development, land, and rural, but these housing policy strategies do not translate to the reality of solving the real issues of low-income housing in the Nigerian policy context.

5.1. Funding

Housing finance is one of the most important strategical themes in any housing programme [27,44,82], as can be observed in the case of Nigerian housing policy. The analysis confirmed funding as a key policy strategy for housing development through proper organization of financial mortgage institutions. The government utilises funds as a strategy for bringing together cooperatives and housing associations to access funds through the Federal Mortgage Bank of Nigeria, with aims to promote long-term sustainable and inexpensive funding options for the housing sector. For example, the government wants to commercialise and recapitalise mortgage institutions to provide linkages between the mortgage market and the capital market in order to drive low-income housing development.

The funding strategic theme also includes strengthening and reviving the national housing fund contribution through contributions from both public and private sectors. This is designed to enhance the ability of the beneficiaries to repay their loans in reasonable periods with less financial strain. Moreover, the funding strategical theme aims to establish a well sustained secondary mortgage market to enhance greater accessibility to a long-term housing fund for house ownership for all. It also seeks to establish an efficient foreclosure system that will provide more guarantees to lenders in cases of default. The Nigerian housing policy strategy on funding is based on creating a conducive policy environment for housing loans, housing financing institutions, smooth lending conditions, household income, and savings that will produce financial policies to aid access to finance for housing development.

5.2. Housing Schemes

The issue of social housing is a significant element of social welfare policy and affordable housing provision. The strategical theme of housing schemes in housing policy refers to the implementation of exceptional measures to deliver housing through the development of different types of housing schemes. For example, one of the Nigerian government's policy strategies for housing is the development of different types of housing tenure, such as

cooperative ownership, rental, and co-ownership. Other types of schemes include models for the renovation of housing units, resettlement schemes, on-site upgrading, building in stages or extendable units, and slum upgrading schemes. The third aspect of this theme is a model for the execution of building projects through public–private partnership and incorporation of micro-enterprises to promote social housing schemes, such as agro-housing pilot schemes as a means of generating employment opportunities and as an income-generation strategy for mortgage repayment for no-income and low-income groups.

This theme includes programmes aimed at strengthening and completing abandoned housing programmes and projects for low-income groups and establishing co-operatives and housing associations that meet the needs of low-income earners as well as the implementation of pilot schemes and programmes of about one million new housing units across the country to support and encourage the inclusion of communities for urban upgrading programmes and schemes for replication by rural dwellers. Moreover, the Nigerian government policy strategy for housing is aimed at collaboration through public–private partnerships (PPPs) in order to design, construct, and maintain about 600,000 housing units. Furthermore, this strategy also provides sites and services' schemes for housing to embark on and sustain appropriate urban renewal programmes in blighted areas nationwide.

5.3. Land

The land strategical theme relates to providing, delivering, and developing land for affordable housing development. This theme also calls for the development of an effective land administration system to make land ownership available, accessible, and easily transferable at affordable rates that are beneficial to all stakeholders in both the private and public sectors to support housing provision. A common feature of the land strategy for housing development is its marginal significance as it mandates governments at different levels, i.e., federal, state, and local, to allocate land for no- and low-income housing projects for effective housing development. The strategic theme of land for housing provision in the policy documents is also linked to issues of use rights and disposal rights on land for housing development. The strategic theme of land suggests possible land advocacy that simplifies the process of land registration by integrating all land registries into a national land depository. It aims to provide secure, registerable, and marketable titles on land with secure tenure that is easily available, accessible, transferable, and at an affordable price for housing development in Nigeria for all income groups. The land delivery system is engineered by the traditional authorities, such as monarchs, chiefs, and landlords, and the state government. According to Rakodi and Leduka [83], the land delivery system in sub-Saharan Africa is also organised through formal and informal institutions. For example, formal and informal institutions decide the land delivery system in Nigeria in the context of allocation and distribution of land rights. The Land Use Act of 1978 gives the state the right to own and administer land subject to the state's jurisdiction, while the traditional authorities are empowered by customary rules, conventions, and norms passed down from one generation to another to own and administer land in the traditional setting.

5.4. Research and Development

The development of the housing industry through policy mechanisms has been one of the main strategies of the Nigerian government policy plan in the provision of adequate, effective, and affordable housing. The government policy strategy has been to invest in programmes that are focused on research and development and work towards the production of local material resources to stimulate effective housing development and economic growth. The strategic theme of research and development seeks to modernise all existing professionals in technical and vocational training centres in terms of building a newly sustainable and productive skilled manpower base for the housing industry by expanding training in construction skills that will enhance the production and quality of local building materials. This aimed at helping reduce the cost of production of houses by developing

and helping in the promotion of appropriate designs and production technologies for the housing sector.

There are other strategies that target the provision of adequate funding for the improvement of research and development (R&D) in order to solve the issues of availability and affordability of building materials using technologies. The strategic theme of research and development focuses on the commercialisation process for research and development via the institute of building and road research. In addition, the development and promotion of the national housing market aims to ensure the growth and development of small- and medium-scale industry in the building material subsector, which should result in employment and wealth creation.

5.5. Implementation

The implementation strategical theme as a policy strategy for housing development in Nigerian housing policy is focused on the issue of implementing legislation and regulations. This is intended to enforce the control and monitoring of housing delivery, such as the National Housing Commission, that would regulate and control the housing provision and development activities. The strategy directs the actions of all stakeholders in the housing sector who administer policies and programmes affecting housing provision and development. The strategic theme of implementation focuses on the legal and regulatory framework. It provides a legal and regulatory environment and incentives that are meant to attract public–private partnership (PPP) in mass housing development to meet the desired outcomes of the housing policy. For example, the implementation strategy determines what, where, and how housing programmes and schemes should be erected by enforcing the provision of the National Building Code (NBC).

Therefore, the implementation strategy also requires government at all levels (i.e., federal, state, and local governments) to designate sufficient space for housing for various income groups and persons with disability. Further, the implementation strategy helps in the strengthening of public institutions involved in the housing delivery at all levels of the government through institutional frameworks for effective housing delivery.

5.6. Governments

The role of government at all levels (i.e., federal, state, and local governments) in the housing sector is very much emphasised as a policy strategy in strengthening the housing sector. The strategic theme of government as a body aims to assemble all stakeholders, such as architects, builders, and cooperatives, to facilitate approved land-use and building designs. This strategy can be achieved through the state and local governments' implementation strategies for building low-income housing projects. The federal government through its housing policy strategy wants to promote an effective institutional mechanism across the country to ensure the provision and maintenance of low-income housing for a decent, safe, and healthy environment.

The government incentives aim to foster collaboration and partnership at sub-national levels and among implementing agencies and entities to develop guidelines. The strategic theme of government encourages a participatory approach, involving all important stakeholders in the state and local government areas to produce and implement a unified and integrated infrastructure development for housing. The federal government plans to ensure the use of relevant and fully registered Nigerian professionals to provide appropriate designs and management among research institutes and private organisations to encourage partnership in housing delivery. In addition, the government strategy aims to encourage the establishment of cooperative housing associations to enable rural dwellers to have access to funding for housing development. Furthermore, the strategic theme of government seeks to enhance the socio-economic status of rural dwellers across the country through regional economic and infrastructural planning programmes.

5.7. Rural

The government wants to ensure that all formulated strategies of low-income housing are strongly pursued in rural areas, especially by giving special attention to the housing needs of those living in marine coastal and waterway areas. The rural policy strategies are also aimed at encouraging research into rural planning to develop and promote appropriate models of rural settlement and to empower rural dwellers through the introduction of economic activities to promote employment creation and social housing to address the needs of rural dwellers. The policy also aims to promote housing cooperatives and housing associations as a means of providing access to mortgages and credit facilities to protect housing in rural areas. Moreover, the policy strategy aims to provide training opportunities for professionals and artisans in the built environment in rural areas. This aims to help foster traditional and innovative responses to meeting the housing needs of rural dwellers.

6. Discussion

The primary questions introduced in this article seek to identify strategical themes utilised in housing policies in the Global South through the Nigerian example and how these identified strategical themes translate into practice. This analysis demonstrates that housing policy strategy is recognised through strategical themes with a specific focus on funding, schemes, governments, implementation, development, land, and rurality. The strategical themes are used as a means of combatting the housing shortage and enhancing housing provision for low- and middle-income earners. Therefore, housing shortage challenges can be solved primarily through the effective implementation of strategical themes. In Section 3, we presented the strategical themes in general, and the strategic use of the strategical themes in the housing policies, which are essential for answering this research question. This article does not only reveal the effect of the identified strategical themes on affordable housing development and provision, but its impact is indeed very different in reality. Within these seven themes, the most frequent themes are funding and development. The appearance of these themes was not a shock, as scholars have previously highlighted the issue of housing policy challenges in Nigeria [35,37,63].

The research and development, implementation, funding, government, and land strategical themes are intended to realise housing planning and development in Nigeria. These strategical themes strengthen developmental control and the mortgage finance system through the entrenchment of a sustainable mortgage system that is vital to balance housing supply and demand in terms of quantity. The funding strategical theme is also aimed at improving low earners' access to finance, which can help to improve housing financing capability. This assertion is congruent with Liu and Ong's study [84], which found that employing various housing financing models can help improve home financing. For example, the implementation of the funding strategical theme as a strategy was aimed at bringing together cooperatives and housing associations to access funds through the Federal Mortgage Bank of Nigeria and the Nigeria Mortgage Refinance Company (NMRC), with measures to promote long-term sustainable and inexpensive funding options for the housing sector.

The funding strategical theme of the housing policies also encourages the government to promote several housing financing schemes for low- and middle-income earners in order to promote home ownership among all income classes. For instance, the Nigerian Mortgage Refinance Company (NMRC), housing loan scheme, federal integrated staff housing program, and financing under the National Housing Fund are housing financing schemes aimed at improving low- and middle-income earners' ownership of affordable housing. The funding strategical theme is intended to establish a highly sustainable secondary mortgage market to enhance accessibility to long-term housing funding for house ownership among all segments of the Nigerian population. The document analysis shows that a lack of funding hinders low- and middle-income earner access to affordable housing. This interpretation means that improving low- and middle-income earners' access to funding can help enhance the housing affordability of low- and middle-income earners

in the Global South. This is supported by the findings of Ebekozein [37] and Ibem [85] that the implementation of participatory and mortgage-based housing policies, along with suitable and sustainable housing loans, enhanced low-income earners' quality of life.

Moreover, Aliu et al. [27] identified mortgage finance as one factor influencing public housing programme failures. The land strategical theme made serviced land with secure tenure easily available, accessible, transferable, and at an affordable price—thus, enabling affordable housing development. Further, the strategical theme, if adequately implemented, is intended to effectively improve housing development and affordability by delivering more affordable housing units, improving home financing capabilities, and lowering housing costs. Regarding the scheme strategical theme, the low-income earners are not well off when it comes to the provision of homes and housing ownership, especially in the Global South. The lack of decent and sustainable housing schemes stands as a vital challenge to low- and middle-income earners; thus, an effective housing scheme is seen as an option for housing ownership. The scheme strategical theme in the Nigerian housing policy context is aimed at the direct housing provision of low-cost housing (LCH) by the government, assisted self-help housing (ASH) by individuals, and sites and services (SAS) housing as provided by the government [26,27]. The scheme strategical theme of housing policy refers to the implementation of exceptional measures to deliver housing through the development of different types of housing schemes and different types of housing tenure, such as cooperative ownership schemes, rental schemes, and co-ownership schemes that aim to improve an individual's ability and assist them by ensuring housing affordability and ownership.

An adjustment of land prices through an effective approach is required to ensure land supply for housing development as well as to improve housing affordability [84,86]. The lack of access to land stands as a vital challenge to housing development for low-income earners, as land is seen as an asset in housing development. The development of an effective land administration system helps to make land available, accessible, and easily transferable at affordable rates that are beneficial to all stakeholders in both the private and public sectors to support housing provision [87,88]. Scholars, such as Ebekozien et al. [60], agreed that a functioning land administration system will encourage developers to develop low-cost houses that are suited to low- and middle-income earner ownership. A common feature of the land strategy for housing development is its marginal significance as it mandates governments at all levels (i.e., federal, state, and local) to allocate land for no- and low-income housing projects for effective housing development.

The development strategical theme is targeted at the provision of adequate funding for the improvement of research and development (R&D) in solving the issues of availability and affordability of building materials using current technologies. The government policy strategy has been to invest in programmes that are focused on research and development and towards the production of local material resources to stimulate effective housing development and economic growth. However, the application of a developmental strategy requires an effective implementation of housing policy. The focus on an implementation strategical theme entails implementing legislation and regulations that aim to enforce the control and monitoring of housing delivery that would regulate and control housing provision and development activities to increase the supply of affordable units. Thus, an effective and efficient implementation strategy is vital for the implementation of multifaceted interventions, schemes, and programmes [89].

From the analysis of the policy documents, the government strategical theme aims at solving the issue of a lack of collaboration and weak institutional frameworks in the Nigerian housing sector, as identified in [63]. The development of rural areas is one of the main policy strategies of governments; in the Nigerian housing policy documents, rural housing provision is one of the key policy strategies for a sustainable rural development that intends to aid housing provision. However, this has not had much impact on housing ownership and affordability, as there still exists a high prevalence of homelessness and unaffordability of housing. Thus, the issue may not be housing policy per se, but rather

the ways in which strategy and inconsistencies in housing policy processes have adversely affected low-income earner housing affordability. As such, an effective and efficient implementation strategy is vital for the implementation of multifaceted interventions, schemes, and programmes [89] aimed at achieving the desired outcome of the policy programmes. Conclusively, an effective housing policy in line with the concept of sustainability must be centered primarily on policies related to regional and urban development, governance, and finance [24].

Sustainability is a multifaceted concept that integrates economic, environmental, and social aspects. In the context of housing, housing policy strategical themes based on sustainability criteria must meet the basic housing needs. However, connecting housing policies to sustainability involves actions that integrate the overall quality of living spaces and the social and spatial aspects [22] with a consideration of natural resource consumption in housing development. In other words, connecting housing policy strategical themes to sustainability involves integrating sustainability objectives to housing policy to meet the housing needs of a society. Thus, ineffective housing policy and a lack of an integrated urban planning strategy may make housing policies unsustainable and, as such, result in a housing shortage with severe social effects and negative impacts on economic development [10].

7. Conclusions

This article has explored public housing policy strategy as set forth in Nigerian housing policy documents. In the analysis of these documents, we have analysed the strategies utilised by the federal government in housing policy to provide affordable housing to low-income earners in Nigeria, using the national housing policy papers, national housing fund acts, the Nigeria Vision 2020 plan, the national integrated infrastructure master plan, and documents from the Federal Ministry of Power, Works, and Housing (FERMA), along with housing policy programme documents from the Rivers State Ministry of Urban and Housing Development to unravel the overall housing policy strategies. We focused on the question of what strategical themes are used in housing policy in order to provide housing for low-income earners.

The analysis shows that the housing policy strategies do not really translate to the reality of solving the real issues of low-income housing in Nigeria. For example, words and themes arising from the policy text data relate to solving the general issues of housing, using seven key strategies, such as funds, schemes, governments, implementation, development, land, and rural. This analysis confirms that housing finance is a major strategy for funding housing schemes through the implementation of government and stakeholder partnerships in providing land for affordable housing development for low-income groups for both rural and urban dwellers. However, these seven key strategies are still a major issue militating against affordable housing delivery in Nigeria.

From the analysis of the data, it is clear that the strategy of finance in funding affordable housing development was a result of the challenges associated with the general housing finance system and the role of financial institutions in creating an effective and sustainable mortgage system to enable access to credit for affordable housing development. The use of housing schemes was to solve issues of affordable housing ownership, and the role of government in the policy was to provide collaboration through public–private partnerships to improve the housing sector, by creating economic growth and development. Moreover, the lack of implementation creates a weak legal and regulatory framework for affordable housing development. The land strategy for housing development was due to issues of ineffective land administration associated with land use rights and disposal rights.

From the above discussions and conclusions, through an identified parameter in analysing the collected data and literature reviewed, it is obvious that the Federal Government of Nigeria, saddled with the responsibility of providing affordable housing to Nigerians, has not been able to meet the housing needs or provide affordable housing to low-income earners. This is in line with the study carried out by Iheme et al. [31], where the

data presented showed flawed policies implemented by the government. Ebekozien [37] also confirmed the worrying state of the housing policies in Edo Sate, Nigeria. According to Oyo-Ita [38], this is due to the failures of past governments in formulating and utilizing functional policies to benefit the people of the state. This finding reveals that the targeted group, i.e., the low-income earners, find it difficult to access the public housing system, as the intended allocated housing units failed to reach them due to such factors as the poor implementation of housing policy strategies. The findings also indicated that the outcomes and effects of the strategical theme of housing schemes for housing policy programmes have been unreliable, making housing unaffordable for low-income earners.

Further, the authors acknowledge several limitations of this article. Personal bias and choices may have inadvertently influenced the identification of policy documents, the selection of text, and the policy programmes that were utilised for the analysis as we only included policy documents informing the discussions on housing policy in Nigerian context. However, given the enormous number of available public policy documents, we recognise that we may have missed out some public policy documents in this article. Moreover, subjective bias may be inherent in the qualitative content and thematic analysis, which may have generated insignificant differences in the analysis of the data used in this article. Further, the question of how these themes translate into practice or how these themes are used in practice to provide affordable housing to low-income earners was beyond the scope of this article.

The findings also suggest important policy implications. Firstly, the implementation of ineffective public policies may hinder the strategies of public policies in meeting the housing demands for low-income earners. Secondly, housing policy strategies should be carefully implemented with consideration of all income classes, with an emphasis on the cultural setting of the people, as Nigeria is a complex state. Finally, within the context of housing policy research in Nigeria, the findings of this article identified thematic strategies that will likely help in specifying some future research areas. While these limitations are not critical in defining the research outcomes or results, they would have amplified the standard of validity and reliability.

Finally, this study contributes to future housing policy literature not only by evaluating federal and state government practices and actions in implementing national housing policy programmes but also by describing housing policy strategy and how the federal and state governments respond to policy programmes. Moreover, the results show that the mere availability of housing policy strategy is not sufficient for the efficient and effective provision of affordable housing and that the strategic activation of the housing policy strategy is very important in fulfilling the housing policy objectives. These findings also suggest that policies made by governments across the world will have different outcomes depending on each country´s context.

However, this article has shown an innovative approach in the exploration of housing policy discussion using a qualitative content and thematic analysis to ascertain strategic themes used in the housing policy to promote affordable housing for low- and middle-income earners. The outcome of this research implies that funds, land, research and development, housing schemes, government, and considerations of rurality were important to the provision of affordable housing. This article is also important for policy makers and other stakeholders, for the investment of relevant funds and the application of appropriate and efficient strategic policies in the housing sectors.

This article recommends a proper process of policy formation and implementation of appropriate policies which should focus on implementing legislative and regulative frameworks to monitor and control housing provision delivery and development. These legal and regulatory frameworks should also direct all actions of the stakeholders in the housing sector. We recommend a four-stage housing policy implementation framework for low- and middle-income earners that includes:

Firstly, the implementation of a framework that enables low- and middle-income earners to afford and access private-led market homes. This will ensure that low- and middle-income earners have reasonable access to homes they can pay for.

Secondly, the implementation of a framework that promotes and produces affordable housing units; this will place a mandate (legal restrictions) on affordable housing units produced for low-and middle-income earners to remain affordable to low- or middle-income earners. Thirdly, the implementation of a framework that protects against eviction and displacement. This will ensure that low-and middle-income earners are not displaced because of foreseen and unforeseen circumstances by setting legal restrictions that protect low-and middle-income earners from displacement and evictions. Fourthly, the implementation of a framework that sustains housing supply and aligns it with the housing market. This will promote housing affordability by making it easier for thriving private housing development to increase the general housing supply to meet the housing demand of low-and middle-income earners.

Therefore, the findings from this study propose several avenues for future research. First, there is a need for understanding how these housing policy strategical themes translate into practice or how these identified strategical themes have been implemented to achieve housing development in the Global South. This will help in understanding the outcomes of housing policy with regards to low-income earners. Secondly, the land strategical theme and land policy has a considerable impact on both the supply and demand of housing. Therefore, more research is needed to focus on the way in which land policy instruments promote affordable housing or the way in which the land needed for housing is provided via the land strategical theme and land policy instruments. Furthermore, future research that addresses other housing models for all income classes is necessary to gain more insights. Finally, further studies can look at how sustainable development goals (SDGs) are integrated in the selected policy documents.

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Appendix A

Table A1. Housing programme outcomes in Rivers State.

Year of Provision	Policy and Programmes	Predefined Outcome	Realised Outcomes
1972–1978	National Council on Housing	Target of 1000–4000 dwelling units to be sited in Rivers State	None were constructed
1979–1985	National LCH program and National Housing Program	4000 housing units to be sited in Rivers State	978 housing units were built, which is about 24.45% of the planned units

Table A1. *Cont.*

Year of Provision	Policy and Programmes	Predefined Outcome	Realised Outcomes
1986–1999	Federal Housing Authority (FHA) was launched in 1980 to champion the National Housing Programme. The 1991 National Housing Policy was launched.	4000 housing units were the predefined outcome by the National Housing Program	955 housing units were built
2000–2019	Presidential Housing Mandate and Odili Administration Housing Program	4142 housing units were the predefined outcome	1096 housing units were built
Total		12,142	3029 is about 24.95% Realised outcome

Source: Rivers State Property Development Authority, 2020 and Department of Urban & Regional Planning, Federal Ministry of Power, Works and Housing, Port Harcourt, 2020.

Table A2. Housing Policy Strategy documents text.

Strategy	Coded and Categorised Themes
Funds (35)	Channel sizable parts of pension fund and other funds in housing sector Commercialising and recapitalising the Federal Mortgage Bank of Nigeria to provide a linkage between the mortgage market and the capital market Co-operative Societies and Housing Associations access to funds via the Federal Mortgage Bank of Nigeria Develop and promote measures that will mobilise long-term sustainable and inexpensive funding for the housing sector Energised and reinvigorate the national housing fund contribution Enforcing National Housing Fund contributions for both public and private sectors Enhancing the ability of the beneficiaries to repay their loans at reasonable periods with less strain Establish and sustain a secondary mortgage market to enhance greater accessibility to long-term housing funding for house ownership among all segments of the population Establishing an efficient foreclosure system that will give more guarantees to lenders in cases of default Financial sector operators and regulators to develop an effective primary housing finance system Financing of housing development, in particular low-cost housing for low-income workers Funding for the provision of houses for Nigerians at affordable prices Funding of site and service plots at affordable prices Government to reduce the cost of building a house Grant's fiscal incentives to small- and medium-scale local manufacturers of building materials Incentives for the capital market to invest in property development Instituting default prevention mechanisms in mortgage finance Long-term loans to mortgage institutions for on-lending to contributors to the Fund Mobilisation and the investment SWEAT Capital and Equity Mobilisation of other pools of funds through internal and external sources Nigeria Mortgage Refinance Company (NMRC) to develop the mortgage market and provide affordable housing Provide easy access to long-term, affordable, and adequate housing finance Provide fiscal incentives (e.g., tax waivers, duty waivers, etc.), service land, and expeditious Providing funds for detailed empirical study of the establishment of an efficient primary mortgage market Providing targeted subsidies and housing finance credit guarantees to facilitate home ownership by lower income groups/people with disabilities and establishing a mortgage Provision of seed money by the Federal Government, and other interested contributors, for the implementation of the initial and subsequent phases of the scheme Putting in place an enabling housing finance structure Recapitalisation of the Federal Mortgage Bank of Nigeria Recapitalise the Federal Mortgage Bank of Nigeria for a secondary mortgage market and strengthen the primary mortgage institutions

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
Funds (35)	Strengthening the mortgage finance system through the entrenchment of a sustainable mortgage regime Supply of loans for the purpose of building Title insurance system that will mitigate credit risk To eliminate problems associated with finance to encourage sufficiently long-term mortgage repayment for no and low-income earners, and rural dwellers To facilitate linkage of that market to the capital market to provide long-term financing and facilitate affordable and sustainable liquidity for housing To improve access to mortgage credit and partner the private sector
Development (26)	Invest in programmes geared towards research, development, and production of materials Local resources, with a view to stimulating effective housing development and economic growth Rehabilitating all existing professional, technical, and vocational training centres and building new ones to ensure sustainable production of skilled manpower for the housing industry Rehabilitating all existing professional, technical, and vocational training centres and building new ones to ensure sustainable production of skilled manpower for the housing industry Reducing the cost of production of houses by developing and promoting appropriate designs and production technologies for the housing sector Providing adequate funding for R&D to improve the availability and affordability of building materials and technologies Commercialising the products of R&D of the Nigeria Building and Road Research Institute, and other allied institutes Develop and promote the use of certified locally produced building materials as a means of reducing construction costs Develop and promote a national housing market Develop and promote the use of appropriate technology in housing construction and materials production To promote the growth and development of small- and medium-scale industry in the building material subsector Encourage and fund the training of skilled manpower required for the building industry Encourage the use of conventional building systems as a means for mass housing to stimulate employment and wealth generation Devise simple and affordable techniques for upgrading existing housing stock Provide statistical data for the effective process of housing delivery in Nigeria Establish a reliable and comprehensive database for generating statistical information for housing development Adequate incentives and an enabling environment for greater private sector participation in the provision of housing Adopt rural technology in the provision of low-cost housing Develop low-cost building materials and technologies Encourage and popularise the use of local building materials in all building construction projects Develop and promote improved and cost-effective building technologies To improve their skills in the application and maintenance of local building materials Accelerate development of appropriate capacities to achieve sufficiency in the production of basic building materials Develop and execute a system of regularly scheduled maintenance actions to prevent premature failure of building components Ensure effective monitoring and coordination of all building maintenance work
Housing Schemes (22)	Ownership schemes, including cooperative ownership schemes Rental schemes and co-ownership schemes Private sector involvement through public–private partnership Encouragement of public–public partnership Home improvement schemes Resettlement schemes and on-site upgrading Building in stages or extendable units Slum upgrading schemes Incorporation of micro-enterprises in the housing scheme for generating employment opportunities No-income and low-income housing estates To efficiently complete abandoned housing programmes and projects for low-income groups

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
Housing Schemes (22)	To promote the establishment of micro-enterprises in social housing schemes Agro-housing with pilot schemes as means of income and Mortgage repayment for low-income groups To encourage and establish co-operatives and housing associations for meeting the housing needs of the low-income earners Support and encourage the inclusion of Community Urban Upgrading Programmes adopt and produce pilot no-income and low-income housing schemes for replication by rural dwellers Implementation of pilot schemes across the country, with a provision of not less than 10% of the targeted one million new housing units Planning, design, construction, and maintenance of 600,000 housing units through public–private partnerships (PPPs) Planning, design, construction, and maintenance of 240,000 affordable housing units by the Federal Housing Authority (FHA) and other reputable developers and planning, design, and construction of other key housing initiatives Embark on and sustain appropriate urban renewal programmes in blighted areas Provide a sites and services scheme for housing nationwide
Implementation (20)	Promote appropriate legislation to facilitate the enforcement of the rights of the rural people when their environment is degraded Adopt functional design standards that will facilitate cost reduction, affordability, acceptability, and sustainability, which will respond to the cultural and regional peculiarities of potential users by 2023 Establishing an effective legal and regulatory framework to enforce the control and monitoring of housing delivery, such as a National Housing Commission, that would regulate and control the housing sector Providing incentives and the necessary legal and regulatory environment to attract public–private partnership (PPP) in mass housing development Enforcing the provision of the National Building Code (NBC) and Mandating local communities to designate sufficient space for housing for various income groups and persons with disabilities Develop and sustain the political will of the government for the provision of housing for all citizens Strengthen all existing public institutions involved in the housing delivery at the federal level Institutional framework for housing delivery Strengthen the institutional framework to facilitate effective housing delivery Enact laws and make regulations to prevent and control fire incidence in Nigeria Strengthen and sustain the Federal Ministry of Housing and Urban Development to harmonise and monitor housing delivery Maintain and strengthen the department in the standard organisation to monitor and set minimum performance standards in the building industry Restructure and adequately capitalise all federal institutions under housing to effectively perform their statutory roles Restructure and adequately fund the Nigerian Building and Road Research Institute to perform its statutory role Nominate relevant professional bodies, stake holders and organise private sector into the policy making structures Review all necessary provisions of the Mortgage Institutions Act, Federal Mortgage Bank of Nigeria Act, Trustee Investment Act, Insurance Act, National Housing Fund Act, Employees Housing Scheme (special provision) Act, Federal Government Staff Housing Board Act, Urban Development Bank Act, and Land use Act, to make them more effective and enforceable Ensure the enforcement (government example) of the provisions professional practice in the building industry Planning approval process to encourage private sector participation in housing delivery Provide incentives and the necessary legal and regulatory environment to attract PPP in mass housing development
Government (20)	Encourage all non-governmental organisations to build and facilitate the building of social housing estates with possible government incentives Stakeholders' involvement in designing affordable housing or low-income housing, such as Architectural designs to meet the socio-cultural needs of low-income groups To encourage and establish co-operatives and housing associations for meeting the housing needs of low-income earners

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
Government (20)	State and local governments' implementation of social housing projects with approved land-use and building designs to meet different socio-cultural needs with considerable concessions on approval and fees Encourage the establishment of Housing Co-operatives and Associations Ensure the establishment of appropriate institutional machinery in all communities for efficient maintenance of infrastructure Encourage and support through Housing Co-operatives and Housing Associations in the provision and maintenance of low-income housing for a decent, safe, and healthy environment Securing the buy-in of State Governors, Local Government Chairpersons and other strategic partners, through voluntary accession Government incentives to foster collaboration, partnership at sub-national levels, and among implementing agencies and entities Developing of guidelines for the operationalisation of schemes through a participatory approach, involving all important stakeholders States and local governments to produce and implement a unified and integrated infrastructure development for housing Promote active participation of other tiers of government in housing delivery Ensure the use of relevant and fully registered Nigerian professionals to provide appropriate designs and management in housing delivery Promote and encourage partnership between research institutes and private organisations Establish regional economic and infrastructural planning programmes to enhance the socio-economic status of the rural dwellers across the country Encourage the establishment of cooperatives or housing associations to enable rural dwellers has access to funding Seeking international bilateral and multilateral assistance for promoting housing and urban development To promote the establishment of building societies as sources of credit for housing construction
Land (18)	All government levels (i.e., federal, state, and local) allocate land for no- and low-income housing projects for effective housing development Reverse unutilised public lands in the country for social housing Provision of land at low prices in support of social housing Simplify the process of registration and documentation of landed property and make serviced land with secure tenure easily available, accessible, transferable, and at an affordable price, for housing development Provide secure, registerable, and marketable titles on land Computerise the various land registry systems Developing an effective land administration system to make land ownership available, accessible, and easily transferable at affordable rates Provision of secure, registrable, and marketable titles on land Computerise the various land registry systems and develop an efficient national land information system Implement reform policies towards the development of a more effective land administration system Establishment of an efficient and transparent land title transfer system that simplifies existing land procedures for effective title and consent delivery To open up new layouts and provide sites and services for the private sector to develop affordable and decent mass housing Make land for housing development easily accessible and affordable Encourage the establishment of and sustain land registries in all tiers of government across the country Promote modernisation, computerisation, and Strategy Coded and Categorised Themes Funds (35) Channel sizable parts of pension fund and other funds in housing sector Commercialising and recapitalising the Federal Mortgage Bank of Nigeria to provide a linkage between the mortgage market and the capital market Co-operative Societies and Housing Associations access to funds via the Federal Mortgage Bank of Nigeria Develop and promote measures that will mobilise long-term sustainable and inexpensive funding for the housing sector Energised and reinvigorate the national housing fund contribution Enforcing National Housing Fund contributions for both public and private sectors Enhancing the ability of the beneficiaries to repay their loans at reasonable periods with less strain

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
Land (18)	Establish and sustain a secondary mortgage market to enhance greater accessibility to long-term housing funding for house ownership among all segments of the population Establishing an efficient foreclosure system that will give more guarantees to lenders in cases of default Financial sector operators and regulators to develop an effective primary housing finance system Financing of housing development, in particular low-cost housing for low-income workers Funding for the provision of houses for Nigerians at affordable prices Funding of site and service plots at affordable prices Government to reduce the cost of building a house Grant's fiscal incentives to small- and medium-scale local manufacturers of building materials Incentives for the capital market to invest in property development Instituting default prevention mechanisms in mortgage finance Long-term loans to mortgage institutions for on-lending to contributors to the Fund Mobilisation and the investment SWEAT Capital and Equity Mobilisation of other pools of funds through internal and external sources Nigeria Mortgage Refinance Company (NMRC) to develop the mortgage market and provide affordable housing Provide easy access to long-term, affordable, and adequate housing finance Provide fiscal incentives (e.g., tax waivers, duty waivers, etc.), service land, and expeditious Providing funds for detailed empirical study of the establishment of an efficient primary mortgage market Providing targeted subsidies and housing finance credit guarantees to facilitate home ownership by lower income groups/people with disabilities and establishing a mortgage Provision of seed money by the Federal Government, and other interested contributors, for the implementation of the initial and subsequent phases of the scheme Putting in place an enabling housing finance structure Recapitalisation of the Federal Mortgage Bank of Nigeria Recapitalise the Federal Mortgage Bank of Nigeria for a secondary mortgage market and strengthen the primary mortgage institutions Strengthening the mortgage finance system through the entrenchment of a sustainable mortgage regime Supply of loans for the purpose of building Title insurance system that will mitigate credit risk To eliminate problems associated with finance to encourage sufficiently long-term mortgage repayment for no and low-income earners, and rural dwellers To facilitate linkage of that market to the capital market to provide long-term financing and facilitate affordable and sustainable liquidity for housing To improve access to mortgage credit and partner the private sector Development (26) Invest in programmes geared towards research, development, and production of materials Local resources, with a view to stimulating effective housing development and economic growth Rehabilitating all existing professional, technical, and vocational training centres and building new ones to ensure sustainable production of skilled manpower for the housing industry Rehabilitating all existing professional, technical, and vocational training centres and building new ones to ensure sustainable production of skilled manpower for the housing industry Reducing the cost of production of houses by developing and promoting appropriate designs and production technologies for the housing sector Providing adequate funding for R&D to improve the availability and affordability of building materials and technologies Commercialising the products of R&D of the Nigeria Building and Road Research Institute and other allied institutes Develop and promote the use of certified locally produced building materials as a means of reducing construction costs Develop and promote a national housing market Develop and promote the use of appropriate technology in housing construction and materials production To promote the growth and development of small- and medium-scale industry in the building material subsector Encourage and fund the training of skilled manpower required for the building industry Encourage the use of conventional building systems as a means for mass housing to stimulate employment and wealth generation

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
	Devise simple and affordable techniques for upgrading existing housing stock
	Provide statistical data for the effective process of housing delivery in Nigeria
	Establish a reliable and comprehensive database for generating statistical information for housing development
	Adequate incentives and an enabling environment for greater private sector participation in the provision of housing
	Adopt rural technology in the provision of low-cost housing
	Develop low-cost building materials and technologies
	Encourage and popularise the use of local building materials in all building construction projects
	Develop and promote improved and cost-effective building technologies
	To improve their skills in the application and maintenance of local building materials
	Accelerate development of appropriate capacities to achieve sufficiency in the production of basic building materials
	Develop and execute a system of regularly scheduled maintenance actions to prevent premature failure of building components
	Ensure effective monitoring and coordination of all building maintenance work
	Housing Schemes (22) Ownership schemes, including cooperative ownership schemes
	Rental schemes and co-ownership schemes
	Private sector involvement through public–private partnership
	Encouragement of public–public partnership
	Home improvement schemes
	Resettlement schemes and on-site upgrading
	Building in stages or extendable units
	Slum upgrading schemes
	Incorporation of micro-enterprises in the housing scheme for generating employment opportunities
	No-income and low-income housing estates
	To efficiently complete abandoned housing programmes and projects for low-income groups
	To promote the establishment of micro-enterprises in social housing schemes
Land (18)	Agro-housing with pilot schemes as means of income and
	Mortgage repayment for low-income groups
	To encourage and establish co-operatives and housing associations for meeting the housing needs of the low-income earners
	Support and encourage the inclusion of Community Urban Upgrading Programmes
	adopt and produce pilot no-income and low-income housing schemes for replication by rural dwellers
	Implementation of pilot schemes across the country, with a provision of not less than 10% of the targeted one million new housing units
	Planning, design, construction, and maintenance of 600,000 housing units through public–private partnership (PPPs)
	Planning, design, construction, and maintenance of 240,000 affordable housing units by the Federal Housing Authority (FHA) and other reputable developers and planning, design, and construction of other key housing initiatives
	Embark on and sustain appropriate urban renewal programmes in blighted areas
	Provide a sites and services scheme for housing nationwide
	Implementation (20) Promote appropriate legislation to facilitate the enforcement of the rights of the rural people when their environment is degraded
	Adopt functional design standards that will facilitate cost reduction, affordability, acceptability, and sustainability, which will respond to the cultural and regional peculiarities of potential users by 2023
	Establishing an effective legal and regulatory framework to enforce the control and monitoring of housing delivery, such as a National Housing Commission, that would regulate and control the housing sector
	Providing incentives and the necessary legal and regulatory environment to attract public–private partnership (PPP) in mass housing development
	Enforcing the provision of the National Building Code (NBC) and
	Mandating local communities to designate sufficient space for housing for various income groups and persons with disabilities
	Develop and sustain the political will of the government for the provision of housing for all citizens
	Strengthen all existing public institutions involved in the housing delivery at the federal level
	Institutional framework for housing delivery

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
Land (18)	Strengthen the institutional framework to facilitate effective housing delivery Enact laws and make regulations to prevent and control fire incidence in Nigeria Strengthen and sustain the Federal Ministry of Housing and Urban Development to harmonise and monitor housing delivery Maintain and strengthen the department in the standard organisation to monitor and set minimum performance standards in the building industry Restructure and adequately capitalise all federal institutions under housing to effectively perform their statutory roles Restructure and adequately fund the Nigerian Building and Road Research Institute to perform its statutory role Nominate relevant professional bodies, stake holders and organise private sector into the policy making structures Review all necessary provisions of the Mortgage Institutions Act, Federal Mortgage Bank of Nigeria Act, Trustee Investment Act, Insurance Act, National Housing Fund Act, Employees Housing Scheme (special provision) Act, Federal Government Staff Housing Board Act, Urban Development Bank Act, and Land use Act, to make them more effective and enforceable Ensure the enforcement (government example) of the provisions professional practice in the building industry Planning approval process to encourage private sector participation in housing delivery Provide incentives and the necessary legal and regulatory environment to attract PPP in mass housing development Government (20) Encourage all non-governmental organisations to build and facilitate the building of social housing estates with possible government incentives Stakeholders' involvement in designing affordable housing or low-income housing, such as Architectural designs to meet the socio-cultural needs of low-income groups To encourage and establish co-operatives and housing associations for meeting the housing needs of low-income earners State and local governments' implementation of social housing projects with approved land-use and building designs to meet different socio-cultural needs with considerable concessions on approval and fees Encourage the establishment of Housing Co-operatives and Associations Ensure the establishment of appropriate institutional machinery in all communities for efficient maintenance of infrastructure Encourage and support through Housing Co-operatives and Housing Associations in the provision and maintenance of low-income housing for a decent, safe, and healthy environment Securing the buy-in of State Governors, Local Government Chairpersons and other strategic partners, through voluntary accession Government incentives to foster collaboration, partnership at sub-national levels, and among implementing agencies and entities Development of guidelines for the operationalisation of schemes through a participatory approach, involving all important stakeholders States and local governments to produce and implement a unified and integrated infrastructure development for housing Promote active participation of other tiers of government in housing delivery Ensure the use of relevant and fully registered Nigerian professionals to provide appropriate designs and management in housing delivery Promote and encourage partnership between research institutes and private organisations Establish regional economic and infrastructural planning programmes to enhance the socio-economic status of the rural dwellers across the country Encourage the establishment of cooperatives or housing associations to enable rural dwellers has access to funding Seeking international bilateral and multilateral assistance for promoting housing and urban development to promote the establishment of building societies as sources of credit for housing construction Land (18) All government levels (i.e., federal, state, and local) allocate land for no and low-income housing projects for effective housing development Reverse unutilised public lands in the country for social housing Provision of land at low prices in support of social housing

Table A2. *Cont.*

Strategy	Coded and Categorised Themes
Land (18)	Simplify the process of registration and documentation of landed property and make serviced land with secure tenure easily available, accessible, transferable, and at an affordable price, for housing development Provide secure, registerable, and marketable titles on land Computerise the various land registry systems Developing an effective land administration system to make land ownership available, accessible, and easily transferable at affordable rates Provision of secure, registrable, and marketable titles on land Computerise the various land registry systems and develop an efficient national land information system Implement reform policies towards the development of a more effective land administration system Establishment of an efficient and transparent land title transfer system that simplifies existing land procedures for effective title and consent delivery To open up new layouts and provide sites and services for the private sector to develop affordable and decent mass housing Make land for housing development easily accessible and affordable Encourage the establishment of and sustain land registries in all tiers of government across the country Promote modernisation, computerisation, and human resources development of land registry across the'country Development of coordinated and comprehensive registries for all land belonging to the government and agencies Networking of all land registries into a national land depository Rural (11) Conserve the rural environment for sustainable development in rural housing provision Ensure all earlier formulated strategies regarding no-income and low-income housing are strongly pursued in rural areas Give particular attention to the housing needs of rural areas located in the marine coastal areas as well as along waterways Encourage research into rural planning to develop and promote appropriate models of rural settlement Promote the formation of housing cooperatives and housing associations in rural areas as a means of providing access to credit facilities Provide training opportunities for professionals and artisans in the built environment in rural areas Expand the activities of mortgage banks to cover housing in rural areas Empower the rural dweller by introducing economic activities in the rural areas Encourage employment generation and promote social housing to address the needs of rural dwellers Traditional and innovative responses to meeting the housing needs of rural dwellers Improve the quality of rural housing, rural infrastructure, and the environmentd human resources development of land registry across the country Development of coordinated and comprehensive registries for all land belonging to the government and agencies Networking of all land registries into a national land depository
Rural (11)	Conserve the rural environment for sustainable development in rural housing provision Ensure all earlier formulated strategies regarding no-income and low-income housing are strongly pursued in rural areas Give particular attention to the housing needs of rural areas located in the marine coastal areas as well as along waterways Encourage research into rural planning to develop and promote appropriate models of rural settlement Promote the formation of housing cooperatives and housing associations in rural areas as a means of providing access to credit facilities Provide training opportunities for professionals and artisans in the built environment in rural areas Expand the activities of mortgage banks to cover housing in rural areas Empower the rural dweller by introducing economic activities in rural areas Encourage employment generation and promote social housing to address the needs of rural dwellers Traditional and innovative responses to meeting the housing needs of rural dwellers Improve the quality of rural housing, rural infrastructure, and the environment

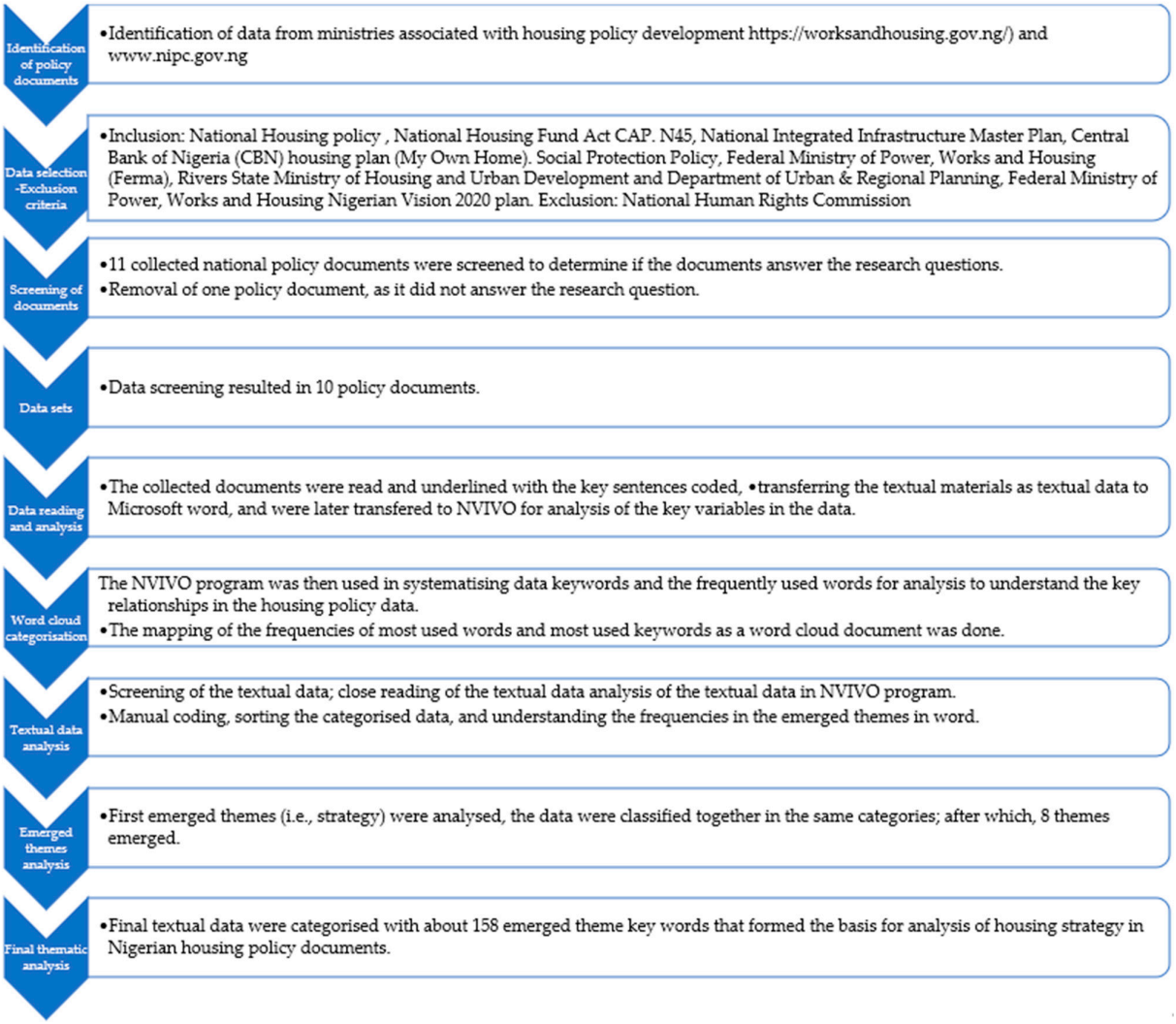

Figure A1. Data selection process, classification, and analysis flow chart.

Figure A2. Word cloud of the most frequent words in the selected housing policy documents.

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Critical Junctures in Sustainable Social Housing Policy Development in Saudi Arabia: A Review

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Abstract: Historicising social housing delivery approach is extensively carried out for Western countries, but studies of social housing policy journey are less focused on developing nations and examining the policy development within resource-abundant Middle Eastern countries is even rarer. Applying a critical juncture approach through the historical institutionalism lens, this paper seeks to understand the evolution of social housing policies within the Saudi Arabian context. An in-depth policy review suggests that the institutional response in this sector has transitioned from a public-welfare perspective to a more neoliberal vision in recent times. The study also indicates a time-lag in policy development regarding social housing within the urban development process in Saudi Arabia compared to global movement. During the past few years, the government has begun to focus on social housing under the developmental housing program with a commitment to link these strategies to the Saudi Vision 2030. While this is a significant policy-shift in the service delivery approach, such vision could be workable as long as sufficient room is built in for other non-government actors to work within their specific protocols and frameworks as they collaborate to provide affordable and appropriate housing for the neediest groups of the society.

Keywords: social housing; critical junctures; housing delivery; public-private partnership; Vision 2030; Saudi Arabia

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1. Introduction

While two-thirds of the world's population is expected to live in urban areas by 2050, the housing challenge will be critical particularly for low-income urbanites [1,2]. Housing is one of the key determinants of sustainable development, which constitutes the critical focus for the well-being of people. Therefore, sustainable social housing initiatives seek to provide standards that achieve the desired goals for developing communities in the longer term [3]. Social housing reforms focus on housing sustainability and its efficient practice [4]. Furthermore, one significant aspect of social housing is to ensure guaranteed access for the needy, which is their fundamental right [5]. Countries across the globe are conscious that housing is one of the key elements in the formation of cities; it has a significant impact on socio-economic status, politics, security, and other aspects of people's lives [6]. Addressing the poor and neediest groups in the society through social housing also helps to maintain social justice and resist further illegal encroachment of public lands that could contribute to an unsustainable urban landscape (Kellett, Christen [4,7,8]).

Furthermore, according to the United Nations Development Programme [9], urban equity increases social development. In other words, social cohesion is an issue of fundamental importance when building new communities for greater social sustainability [10].

It is noticeable that the most significant and fastest-growing construction and real estate markets are in the developing world; however, despite the vast number of projects, the demand exceeds the supply, which causes a problem for the most vulnerable groups.

In addition, failure to consider the aspects of sustainability may reduce the quality of housing, which constitutes an extra burden on these groups in the future concerning quality and maintenance. Therefore, focusing on the sustainability of social housing provides tangible social, economic and environmental results for lower-income groups [11]. The past few decades have seen a shift in emphasis towards developing a sustainable social housing policy to deliver adequate and affordable housing for the urban poor in many developing countries such as the Kingdom of Saudi Arabia (KSA), which is experiencing massive urbanisation and infrastructural development [12]. Processes and mechanisms of social housing delivery introduced in response to the increasing urbanisation and the accompanying housing needs of marginal groups, correlate to political and historical events. From the theoretical perspective of historical institutionalism, such events are termed as critical junctures in the policy development process [13]. Social housing is a widely practised housing model to accommodate the most vulnerable groups in the society [14]. The adoption of social housing indicates the nature of governmental support directed to low-income families to avail appropriate accommodation [15]. Social housing offers a more sustainable perspective of housing, denoted by co-produced housing options delivered by various parties including governments, non-governmental organisations (NGOs) or housing associations, aimed at providing adequate housing to marginalised groups [16]. In each national context, the nature of the model is significantly determined by the character of the vulnerable groups, the actors involved in housing delivery, and the government's political and policy agenda.

There is no doubt that housing policies have undergone manyfold changes historically, based on political decisions and urban growth milestones. The concept of social housing is rooted in developments in the pre-industrial revolution era around meeting housing needs of the working-class population encountering a shortage of sufficient and affordable housing supply [17]. The movement further crystallised from a philanthropic perspective and industrial interests addressing the influx of the working-class and rapid urban growth [18,19].

The social housing policy emerged in the USA to protect workers' rights through public housing programmes [20,21]; however, the policy overlooked the extremely poor groups until the new housing law was issued in 1937 [22,23]. This law provides the mechanism of public funding for low-cost housing in several US cities with a high population density, represented in some projects owned and managed by the public housing authorities [24]. Noteworthy, the USA provides housing in a variety of interrelated ways.

In England, the basis of development was based on several considerations beginning with the establishment of lease controls introduced back in 1916. These controls transformed the English community from a rental dependent society to estate ownership. The middle class benefited from these controls more than the low-income groups [25]. As for social housing in England, it began as a temporary solution resulting from capitalism in order to meet the bottom line of the working class; however, this theory did not resonate with some opponents of the idea. The opponents indicated that the role of the social rental sector declined due to several economic and social factors [17,26].

Additionally, many countries focused on supporting housing policies as a luxury during the post-WWII era, while others focused on supporting the disadvantaged's fundamental rights [14]. Fundamental changes in social housing delivery can be traced back to the 1970s when the support shifted from purchasing and repairing homes to providing subsidised rental help for the urban poor [27]. In the 1980s, social housing provision tended to decline in some European countries, as they gradually encouraged a freer market to provide decent housing for those with limited affordability [19,28].

Since the 1990s, several ideas have emerged (such as co-production, co-housing and affordable housing) based on a neo-liberal ideology/partnership, offering increasing opportunities for communities to contribute to the decision-making processes [29]. Many countries recently have witnessed transformations and trends towards neoliberalism and a reduced dependence on centralisation. The neoliberal philosophy relies on the transfer

of powers partially or entirely to local governments or independent and private sectors. Additionally, the application of neoliberal experiences is not limited to developed countries, as it is also practised in developing countries [30,31]. The central government or welfare state is seen as the leading provider of services in this sector. It is considered that centralised systems are more comprehensive and independent in their decisions, making them more inclined to the welfare state [32]. On the contrary, the decentralised system relies on independence in decision-making and financial support because it depends on its revenues. In turn, this encourages competitiveness, increases efficiency, and provides flexibility for decision-makers to set their priorities [33].

More recently, the Sustainable Development Goals (SDGs 11) have focussed upon eradicating housing inequality and stress through affordable housing for the urban poor [34,35]. Policy changes at a certain point in time can constitute critical strategies for achieving desired goals. Meanwhile shifts in policy directions are often affected by a formal process through institutional reforms and binding guidelines, whereas informal and less structured processes, including contemporary political vision and market forces, equally contribute to the transformation of policy landscape and operational mechanisms [36]. In a wider perspective, policies can be seen as traveling between countries through the conduits of technical and financial support where economic status and a power-imbalance interplay on the policy outcomes [37].

1.1. Saudi Context and the Research Agenda

The Saudi Arabian government's efforts to deal with housing issues have grown in recent years. Given the current housing demand, the government recently has adopted objective reforms of the independent public housing operations comprising policymakers and other stakeholders. The efforts include supporting charitable organisations and non-profit associations to contribute to social housing and the growing population in the housing sector [38,39]. Figure 1 shows the kind of housing developed in the KSA.

Figure 1. The program's 2030 roadmap [40].

This paper sets out to study the critical junctures of social housing policy in Saudi Arabia to trace its trajectory towards sustainability. It is contended that the deconstruction of historical timelines could provide useful insight into the capacities of the institutions and their readiness to adopt more sustainable practices in the housing sector under the Saudi Vision 2030. The KSA's ambitious 2030 vision within its overall framework aims to strengthen the kingdom's strengths. It also aims to transform it from an oil-based economy to more diverse economic regime. One of its long-term goals is to brew a suitable environment for Saudis to own appropriate housing, especially for the poor. This is in addition to increasing the efficiency and performance of the social services system. For an extended period of time, the kingdom has been less focused on social housing agenda. With this new vision, special programmes have been established for social housing, which seeks to activate the non-governmental role through co-production of housing outcomes [38].

Contributions to social housing studies take various forms in the Middle Eastern region [41]. Examining the role of critical junctures in housing policy development process is even rarer. Additionally, studies have often focused on the design, needs, and demographic characteristics of housing in Saudi Arabia [42,43]. In this paper, we attempt to investigate the social housing policy development process through the historical institutionalism lens portraying critical events and institutional mandates that influenced past decisions as well as paved the way for sustainable discourse. Historical studies of social housing policy journey are mostly limited to developed countries and are less focused on developing nations, while dissecting the policy evolution and critical junctures within resource-abundant Middle Eastern countries is even rarer.

The current section provides an overall background of the study, and a literature review on using the critical junctures approach in housing studies. The second section describes the study materials and methods, while the third demonstrates the study area. Then, the fourth section portrays and analyses the findings on the social housing policy development process in the KSA from 1930 until now. Following this, the last two sections discuss key findings, particularly the discussion section presents an invented historical timeline showing the housing policy development process and outcomes. Finally, the concluding remarks focus on tackling the challenges of the sustainability vision in the social housing sector and presenting lessons learned that are applicable for other countries.

1.2. Literature on Historical Policy Development

The theory of historical institutionalism suggests investigating critical junctures and drivers of policy transformation to inform policy development processes. The critical juncture is "the sudden changes at a certain point" describing policy evolution trajectories [44]. Capoccia and Kelemen [45] state that there is "institutional stability for long periods before a dramatic change, known as critical junctures". Therefore, it is an essential building block of historical institutionalism. Hogan [46] further notes that the "new institutionalism, and historical institutionalism in particular, has traditionally regarded the decisions made when an institution is formed, or policy initiated, as possessing a persistent influence".

Historical institutionalism is a widely adopted theoretical approach to understand policy change and for tracing the effects of the past on future policy regime. Historical institutionalism has been attempted through several approaches including path dependency, process tracing, and comparative historical analysis. These approaches share a common focus on historical events, interpreting its causation and effects on the subsequent outcome [47]. Studying historical milestones provides a baseline to evaluate subsequent policy direction [48]. The concept of path dependency has received greater attention in recent times to explain institutional theory through the works of Arthur, North and Krugman. Path dependence theorises "about the tendency of the effects of accumulated decisions to develop from an initial small difference into large cleavages in the free market, developed to explain path dependence with increasing returns" [44,45]. Political scientists and historical socialists engage this approach to explain the historical process by determining significant events and mechanisms within a national context. Path dependency analyses interactive sequences as the base event kicks off from a temporarily and causally bound value to a deterministic chain of events [48]. Path dependence literature relies on a critical juncture framework when institutional historicising focusses on events and milestones in policy development [49,50]. Critical juncture is used as an analytical tool in various contexts that often appears as a series of events including "sudden crisis and dramatic change" [51] that influences the identification of a situation or context and allows the interpretation of reality [52]. It is defined as "relatively short periods of time during which there is a substantially heightened probability that agents' choices will affect the outcome of interest" [45,52]. During the early periods of inception by Lipset and Rokkan [53], critical juncture was used to historicise the progression and maturity of political parties during the early stage of state building [54]. The critical juncture approach is useful to uncover the moments of transformation and underlying factors influencing planning decisions in

the policy development process within centralised political environments [55], such as Saudi Arabia.

Path dependence theory has had a significant impact on evolutionary economics [56]. Institutional economists have also adopted theories based on an understanding of economic changes through path dependency. The QWERTY effect of typewriters [57] is often quoted to suggest how a specific sequence of technological development can be tracked to understand the course of economic changes. During the 1980s, path dependency was used in industrial fields to identify technologies that were not feasible in the industrial process, which disrupted the path of industrial development. Reliance on this concept had a significant impact on the development of the results based on tracing the history of operations [58]. On the other hand, historical institutionalism through critical junctures has been engaged to determine influential political decisions and institutional structures available to planners and policymakers [55]. Choi, Lee et al. [44] further note that "a political power is a clear exogenous factor in creating critical junctures in urban-planning and housing-policy". Such influence acts towards the institutional development through a short-term stepwise process. In the urban planning and housing literature, critical junctures define institutional change models and the development of a country's planning system by accumulating past events. While housing is mostly an inflexible sector as it requires long term investment and longer periods to realise policy outcomes [59], the social housing policy regime in Saudi Arabia has undergone a significant institutional transformation and delivery approach to address the increasing urbanisation and housing demand. It entails major policy change, promoting neo-liberal ideology and a progressive vision for sustainable policy outcomes. In this regard, this study undertakes a systematic historical investigation using the critical junctures concept in order to understand and assess the emerging policy decisions in the area of social housing in Saudi Arabia.

2. Materials and Methods

This paper aims to deconstruct the timeline of the social housing development process in Saudi Arabia tracing the critical junctures in shaping and directing towards an inclusive housing delivery approach, factors affecting institutional transformation and institutional readiness towards a sustainable and collaborative housing policy. In this regard, historical policy documents, academic literature and media reports have been reviewed to draw a historical timeline and to determine the policy directions. The article engages with a geographical area scarcely present in the current literature. Therefore, it brings a much-needed comparative perspective for social housing policies from a country that is not part of the usual set of examples. The review includes several sources, manuscripts, and government documents to examine long historical periods.

Historicising the tradition of planning practice was developed by Dear [60]. He used the term deconstructing planning practice to reflect on concept, design and governance. We have adopted the idea of developing a cognitive map from Dear's work to deconstruct social housing policy trajectories for determining the critical junctures since the early days of the city development. In this regard, the investigation relied upon archival materials and historical policy documents related to housing development in the KSA. The policy documents were organised according to critical milestones in the history and major transformation in terms of development approach and policy shifts. The aim of the review was to understand policy influence, major practice and the impacts on the social housing sector within a particular time-period. A longer historical timeline developed through this review aided in detecting policy changes in line with the broader theoretical paradigms and to understand how the Vision 2030 has been crystalised over time.

Before 1970, the details were poorly recorded and recent literature was consulted who discussed the historical events. Other open access sources include historical documents and photo libraries [40]. After 1970, KSA started a more formal practice by introducing five-years-long planning and information process made available through government sources. The five-year planning documents (1970–2016) were critically reviewed to flesh out the

historical timeline. Apart from these government documents, we also reviewed scholarly literature published on the Saudi and Middle Eastern social housing contexts to understand the debate, impacts on development and to bring some comparative perspectives.

Study Area

The KSA is a member of the Gulf Cooperation Council (GCC) and located in the heart of the Middle East. The country is surrounded by the United Arab Emirates and Qatar in the east; the Red Sea in the west; Kuwait, Iraq and Jordan in the north; Yemen and Oman in the south. Figure 2 shows the administrative boundary, major cities, and transportation routes of the KSA. The GCC states have a variety of social housing policies and practices within highly centralised and controlled political environments. The concept of social housing was marginally developed in this region during the past decades. Due to the resource abundance, many governments from this region initially approached the housing issue by providing supply-side subsidies. They have subsequently changed their approach towards providing demand-side support to serve their growing populations [61]. Al Nasiri [62] observes that while providing housing and facilitating people's own home ownership is still a top priority for all governments in this region, there remains a gap between formulating and implementing their social policies [63].

Figure 2. Administrative map of Saudi Arabia (collected from Google Maps).

The population growth in the GCC countries was among the world's highest for the period 1950 to 2000 [64] and the housing policies in the GCC countries are limited to citizens as the main targets; however, the impacts emanating from the influx of migrant workers have been significant on overall housing demand [63]. In the GCC, social housing took another turn where social housing is provided in the form of independent houses, unlike the high-rise buildings in some countries of the region [41]; however, the sector is comparatively less evolved due to the centralised governance structure and urban social fabric [63,64]. Moreover, the governments often fail to respond in determining the appropriate housing needs, especially for the disadvantaged population [43]. In the KSA, the largest country within GCC, the term "developmental housing" has been commonly used to define social housing as well as public or charitable housing [42]. Developmental housing refers to housing delivered by the government or with government funds to house the neediest citizens [43]. The history of social housing policies and approaches to housing the neediest

citizens reveal critical junctures in policy change and reforms towards a neoliberal ideology in the country. While pursuing historical deconstruction of the social housing policies, in the next section we discuss the structural and ideological constraints and development opportunities since the foundation of the KSA in the early 20th century.

3. Findings on the Social Housing Policy Development Process in the KSA

3.1. Pre-Unification Stage (Since 1930)

In elementary framing, there had been efforts to settle nomads in specific locations which were aimed at improving their livelihood in the 1930s. It is considered one of the first initiatives to housing and settling the poor. Figure 3 shows a historic evidence of the distribution of major settlements in Saudi Arabia before the unification [65]. During this time, the KSA was not developed in terms of construction or planning and the people used to lead a nomadic life which was highly mobile and instable [42].

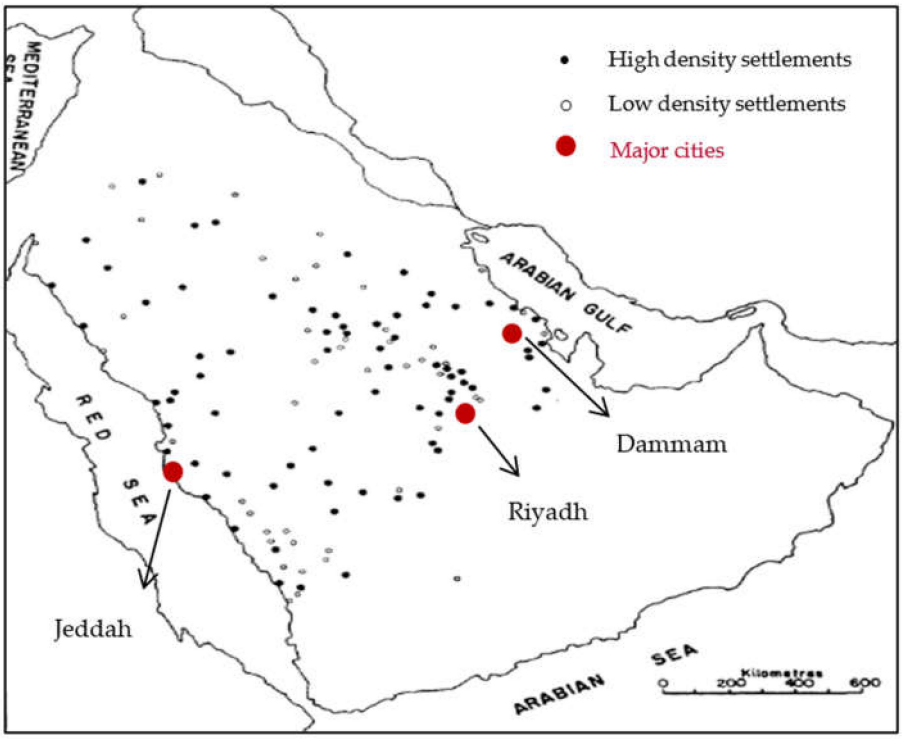
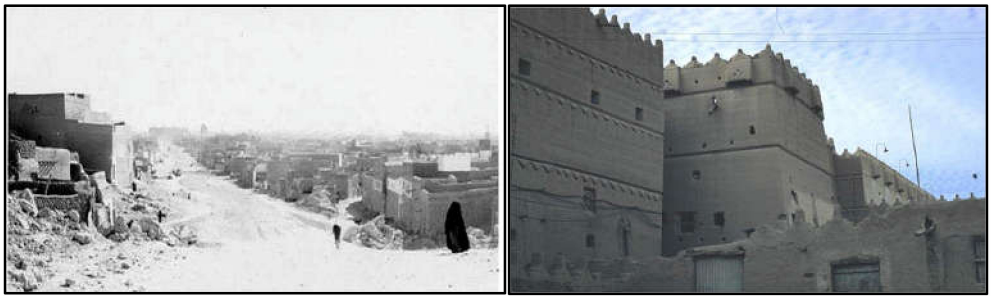


Figure 3. The distribution of major settlements in Saudi Arabia before the unification [66].

The KSA was characterised by very low urbanisation and was a predominantly nomadic society during the pre-unification stage [67]. Unlike other places, the holy cities of Mecca and Madinah observed an accelerated population growth and irregular housing development by religious settlers from abroad [66,68]. There was no formal planning system, and urban areas were mainly deprived of essential urban services. Figure 4a shows an example of old housing patterns in Riyadh inspired by the local environment. Figure 4b shows the old urban residential style and housing lacking organised planning.

Soon after unification, oil was discovered but in non-commercial quantities in 1938. As a result, immigrants flocked to the cities for work opportunities which contributed to a "burgeoning housing demand" [70]. With the local market unable to respond to such pressure, this led to the growth of informal settlements and shantytowns. Figure 5a shows the urban pattern at the beginning of the emergence of the oil cities (Dhahran city 1936) [71].



(**a**) (**b**)

Figure 4. Examples of housing patterns in Riyadh city during the pre-unification stage. (**a**) An old housing patterns in Riyadh; (**b**) An old urban residential style [69].

3.2. The Resource Dependent Path (1931–1969)

The Saudi economy picked up quickly after the WWII, and the state commissioned the Aramco Company (formerly Arabian-American Oil Company) to streamline extraction and business operations. With significant commercialisation of oil resources, Aramco engaged in organised land subdivision and housing development for foreign business groups. Figure 5b shows Aramco's housing pattern and planning for Dhahran in 1949, increasing the number of housing units allocated to employees [71]. The local and immigrant labourers were housed in dormitories, and "married workers occupied outlying areas of American "planned" oil towns and nearby traditional oasis towns" [70]. Such arrangements inflicted anxiety among local workers. Consequently, the government compelled Aramco to launch a 'Home Ownership Programme' in the early 1950s on public land with the provision of interest-free grants for its employees [42]. The initiative turned out to be a popular strategy and offered 41,400 single family residential units by 1999 [70]. To address the local housing needs and the demand of increasing immigrant workers, the government scrambled to establish the first public housing project in Riyadh in 1953 [42]. Subsequently, the government moved to a more formal and direct intervention for housing development. The direct approach included the construction of high-rise public housing that was heavily criticised due to its non-sensitivity towards the local culture and design preferences. The scheme was further supported by the option of granting free lands for the citizens as the number of migrant workers was mounting [42].

(**a**) (**b**)

Figure 5. The development of workers' housing in the city of Dhahran. (**a**) The housing pattern at the beginning of the emergence of the oil cities (1936); (**b**) Residential pattern of oil company employees in Dhahran in (1949) [71].

In 1957, all ministries moved to Riyadh, and the government housed its employees in the new housing project with better urban facilities [42]. Figure 6 shows the new ministries buildings in the city of Riyadh. In the 1960s, municipalities were established in major cities to roll out formal and organised urban planning and development interventions. The Central Planning Commission (CPC) emanating from the Supreme Planning Council arose in 1964 to set economic development plans. Several strategic reports and plans were released from the CPC to support and improve the Saudi economy and future development. The

Five-Year Development Plans were the most notable strategies initiated in 1970, releasing nine comprehensive development plans until 2015 [42].

Figure 6. The new ministries complex [69].

3.3. Critical Junctures and an Evolving Housing Strategy (1970–1995)

The term 'public housing' was first adopted by the Saudi government in the 1970s to denote housing for government employees [72]. The Saudi government's golden era of economic boom started with the dramatic increase of oil prices in the international market. The state invested an estimated amount of USD 500 billion in massive infrastructure development projects across the country [73]. The *First Five-Year Development Plan* (1970–1975) focused on the institutionalised response to tackle housing issues. In this regard, the General Administration of Housing was established in 1971. Later, there was a shift from a direct housing strategy to an indirect approach to attain economic viability in housing delivery. In 1974, an indirect approach materialised through establishing the Real Estate Development Fund (REDF), provisioning USD 66 million in housing loans with zero interest for citizens [42,74]. The Aramco Company also adopted a similar approach to serving their workers in major oil regions. The overall housing policy aimed at achieving social welfare utilising a series of medium and long-term financial mechanisms [75]. Figure 7a,b shows some new housing patterns where the government adopted multi-story buildings projects in several cities during this period.

(**a**) Multi-storey buildings models in Dammam

(**b**) Multi-storey buildings models in Al Khobar

Figure 7. Government housing projects in a number of major cities [76].

The REDF offered loans to individuals and institutions to establish real estate projects for private or commercial use. The support was conditional such as owning land and having a job to ensure repayment of the loan [77]. While the REDF contributed significantly to housing development in the country, the financial supply and land release encountered significant delays and could not cope with the increasing housing demand. A massive influx of overseas workers and migration of the local population to the major cities for a better

lifestyle contributed to an exponential growth of the urban population and subsequent housing shortage [78]. The situation was exacerbated with the higher land price and upward rental market trends in the 1970s [42,75].

The *Second Five Year Development Plan* (1975–1980) established the Ministry of Public Works and Housing (MPWH) in 1975 to streamline the housing management system and also introduced the Municipal Land Grants Programme (MLGP), which recommended 44,000 lots for low-income Saudi nationals to construct their dwellings [79]. Therefore, the state housing policy circled around both direct (housing delivery and free land) and indirect approaches (e.g., through the REDF) to tackle the critical housing shortage. The state policy continued to emphasise social welfare and equity by creating a balance between housing supply and demand, raising homeownership up to 75% and ensuring more affordable housing where housing-related expenditure remained below 20% of the household's total income. In addition, 50% of the newly constructed 122,000 housing units were allocated for society's neediest groups [75]. Table 1 shows the goals and achievements in the housing sector during the second development plan.

Table 1. Goals and achievements in the housing sector during the second development plan [80].

Accommodation	Second Plan Target (Housing Units)	Second Plan Achievement (Housing Units)	Target Achievement Ratio (%)
Permanent residences (Public sector)	25,500	53,600	210 %
Permanent residences (Private sector)	122,100	150,000	123%
Temporary housing for projects	51,000	51,000	100%
Total	198,600	254,600	113%

The REDF faced declining funding and the resulting housing projects drew criticism for not considering local culture, family composition, and housing preference. This is understood as mainly resulting from a rush to deliver" public housing projects" to quickly fix the housing problem [70,78].

3.4. The Rise of Neo-Liberalism (1995–2005)

Another critical juncture in Saudi housing policy development relates to the *Sixth National Five-Year Development Plan* (1995–2000), which enabled the private sector to play an active role in housing development. This basically came as a support as government subsidies for housing tended to decline and the construction of housing units by state agencies decreased significantly. For example, the REDF was reduced considerably to an average of 7,581 (loans per year) compared to 153,320 (loans per year) in the first and second Five-Year Development Plans [80]. Commercial banks that emerged as a shareholder in the housing process to support citizens within a diminishing role of the state, however, operated under strict government regulations. Mubarak [70] reports that,

> *. . . central government regulations, which limit the number of years for amortizing mortgages on housing loans to seven years, have not been changed to accommodate the Plan's promulgation. To date, banks are still not allowed to extend the time period of seven years. (p.9)*

Due to the religious restrictions under the conservative government regime, an interest-based mortgage system failed to develop. As a result, middle and low-income citizens faced challenges in securing adequate housing. Moreover, while the state's support for the REDF declined, the queue on the support list only increased [80]. Consequently, the *Seventh Five-Year Development Plan* (2000–2005) noted that the lack of financial sustainability to support the REDF and the length of time required to obtain new loans were fundamental issues that needed to be addressed. Given the difficulties faced by middle and low-income

citizens, new policies were adopted to provide land at reasonable prices and expedite the disbursing of loans to the neediest groups. In some instances, it was suggested to provide financial support to these groups through special programs. Further, a streamlined building code was issued to reduce housing construction and maintenance costs [80]. In the early years of the new millennium, many charitable foundations emerged that offered free accommodation for the poor [81].

3.5. The Fall of Public Housing and Institutional Transformation (2005–2015)

The *Eighth Five-Year Development Plan* (2005–2010) sought to develop a policy that strengthened the relationship between population variables and sustainable development trends. Population policies were adopted that sought to consider the quantitative and qualitative variables of the population and their distribution [82]. Additionally, substantial funding amounting to USD 10.6 billion was allocated to promote municipal services and housing [82]. Due to the importance given to the housing sector and the rapid population growth, the General Housing Authority (GHA) was established in 2007 [83]. The housing sector was restructured during the *Eighth Five-Year Development Plan*, for effective institutional and organisational development of the sector. The GHA took over the housing development portfolio and embarked upon several strategies to further regularise the system. It included sustaining the supply of residential land and targeting increased homeownership numbers. Several regulations and policies were proposed to deliver appropriate housing facilities for low-income people. Furthermore, support for the REDF and the approval and implementation of real estate financing regulations enabled the private sector to support housing interventions [83]. This plan targeted several developmental housing programmes for the first time. In 2006, USD 2.6 billion was invested in providing 66,000 housing units under this programme. In the following year, the authority of the developmental housing programme was transferred to the Ministry of Social Affairs and then again handed to the GHA. The GHA contributed to shaping the future housing policy framework and launched the first developmental housing projects in some major cities, including 1619 units for low-income groups [69]; however, there were delays in delivering the developmental housing projects. According to the Ministry of Economy and Planning, the stagnated implementation resulted, firstly, from the insufficiency of private real estate financing and secondly, from the limitations of the entities that provide housing for their employees in the public and private sectors [83].

This period observed significant changes in the socio-cultural context and acute housing problems, including a higher unemployment rate, inadequate and unaffordable housing, low levels of homeownership and lack of financial support for residential development [84]. The traditional housing delivery patterns and application of non-pragmatic policies struggled to cope with the emerging urban challenges. Around this time, several failures of state-funded public housing projects were noted in the literature advocating for an inclusive and sustainable policy framework to engage the beneficiaries in the planning process of the public agenda [85]. In response to the shortfalls of the previous plan, the *Ninth Five-Year Development Plan* (2010–2015) called for a national housing strategy focusing on low-income groups and highlighted the role of the private sector [84]. The plan was targeted to meet 80% of the total housing demand (1.25 million housing units) [84] (Table 2). In 2011, the GHA transformed into the Ministry of Housing to better coordinate the housing sector. The government sought to support it with exceptional funding to tackle the cumulative effects of the previous plans. For example, the REDF fund was realigned, and a total of USD 10.6 billion was injected for effectiveness and timely loan disbursement [79]. Indeed, the government allocated around USD 66.6 billion for this purpose [63,64]. Nevertheless, this development plan faced several challenges regarding the adequacy of housing supply, with increasing homeownership, managing the pricing levels for land and housing units, and ensuring financial sustainability [84]. A *Tenth Five-Year Development Plan* was subsequently proposed to provide adequate housing for all with a notable contribution from

the private sector. The tenth plan was, however, discontinued and replaced by the current Vision 2030 [84].

Table 2. The estimated housing demand during the Ninth development plan.

Housing Demand	Ninth Plan Target (Housing Units) *
New housing units for Saudis	800,000
New housing units for non-Saudis	200,000
Housing units to meet the demand carried forward from the Eighth Development Plan	70,000
Residential units required for replacement	70,000
10% reserve units to ease rent inflation	110,000
Total	1,250,000

* No data for ninth plan achievement in the tenth plan because tenth plan was discontinued and replaced by the current Vision 2030 [83].

3.6. Vision 2030 (2016 Onward)

The KSA has experienced unprecedented urbanisation since the foundation of the country in the 1930s, when it was below 10%. It reached 21% in the 1950s and in 2014 it was reported to be around 85% [42]. By the end of the nine Five-Year Development Plans, the overwhelming demand for housing had reached 1.45 million, among which 15% represented disadvantaged groups, including families comprising widows, orphans, seniors, and low-income people. In the last decade, disparity between the housing supply and demand became wider than ever before. The REDF has been exhausted, with a long queue of families (over 62,000 applications) waiting for housing loans [86,87]. Moreover, "the pressure on the supply side for middle- and low-class housing remains unaddressed" [85]. It is reported that due to the lack of specific eligibility criteria to determine disadvantaged beneficiaries, many users resorted to circumventing housing regulations [88]. The instability of overall housing policies in the KSA reflected the government's struggle to manage an unprecedented urbanisation and in-migration of foreign workers, particularly in oil-related industries. While the state had continued to support the real estate monopolies since the oil boom, affordable housing for the neediest remained far behind due to the speculation of the housing market.

To quickly respond to this stagnant situation, the Ministry of Housing returned to a direct housing delivery approach instead of promoting housing loan schemes. This was also followed by initiating a series of recent subsidies and cuts. Due to unstable oil prices over past years, the budget deficit of the Kingdom further complicates the housing market [89]. As a result, the authorities decided to reduce the funds earmarked for providing housing subsidies. There has been a realisation that low-income families suffered as the housing prices remained beyond their purchasing capacity even as the overall target of housing supply was sufficiently met [90]. In 2016, the state embarked upon a new mission by introducing a post-oil plan to strengthen its effort for an adequate and affordable housing provision, particularly for the people most in need. The policy seeks to address the limitations of previous plans and housing strategies by (i) considering the socio-economic context of the beneficiaries to determine appropriate housing design; (ii) increasing state support to house low and middle-income citizens through the enhanced resourcing of REDF and finally (iii) promoting partnerships and cooperation with the private and non-profit (charitable organisations) sectors [12]. This has also been facilitated by the commitment to ensure institutional efficiency and an appropriate policy framework based on neo-liberal ideology in the housing sector (MOH 2020a). The UN [84] further highlights that "the Ministry of Housing is approaching such [public-private] partnerships by strengthening regulatory frameworks and offer incentives to the private sectors to construct social housing".

The concept of developmental housing has been further reiterated through Vision 2030 [91]. The developmental housing initiative focuses on encouraging contribution from the non-profit sector through agreements of cooperation [88]. There is a deliberate acknowl-

edgment of the positive contribution civil society groups, such as charitable organisations, can make in housing provision. While the government plans to achieve 70% homeownership in this long-term strategy, unprivileged citizens are to receive the utmost priority [38]. Finally, the Saudi Vision 2030 for Comprehensive Development plans did not neglect meeting sustainability needs. Indeed, the rapid urban and residential development aspect has considered many aspects concerning sustainability for newer generations of social houses. This is in addition to adopting social housing designs that keep pace with modernity and move away from traditional housing such as high-density residential buildings [38–40]

4. Discussion

A deconstruction of the timeline shows that social housing as a structured and planned concept did not appear until the beginning of the last century. The initial efforts were restricted to housing the lower working class in the cities [24] (Figure 8). It was mainly aimed at housing the working poor to increase and improve industrial production. Historically, working-class housing began in Europe during the sixteenth century, specifically in Germany. The idea gradually developed until workers' housing or so-called company towns appeared in the nineteenth century. It aimed to create affordable housing by company and industry owners for their workers [17]. Czischke and Gruis [28] state that the demand for housing was the result of the industrial revolution and rapid urban growth. Therefore, due to the urgent housing needs that appeared in Europe, the idea of social housing arose.

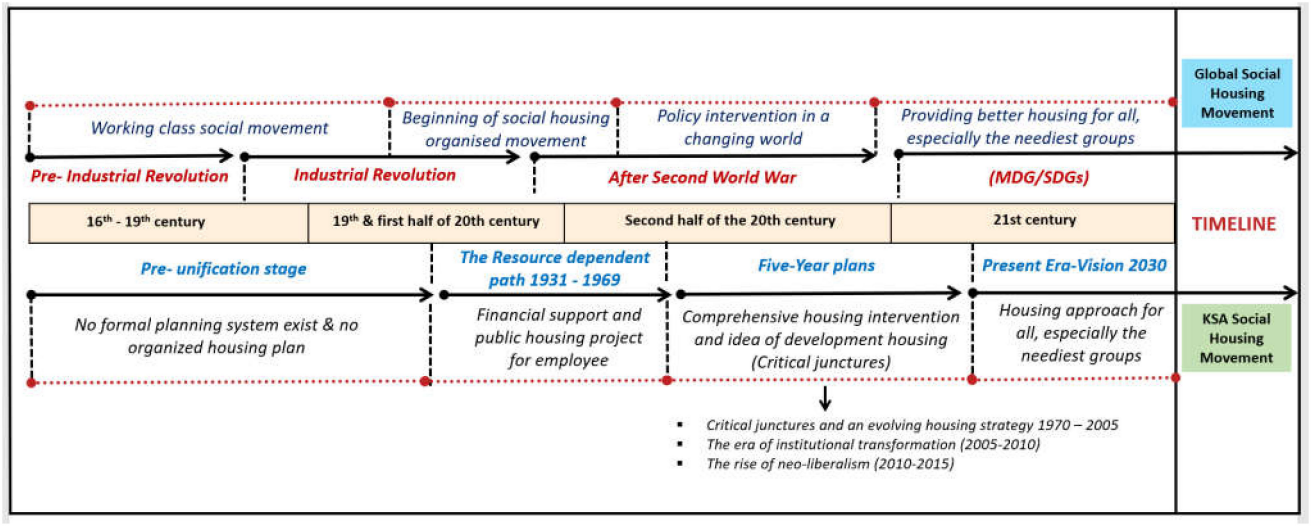


Figure 8. Historical timeline of social housing policy development in Saudi Arabia.

Efforts moved from a philanthropic perspective to industrial interests shaping the social housing policies applied by many governments; however, dire economic conditions caused by the two world wars caused development and social housing policies to take a different turn. Although the state's strategic move was generous and promising, Kyriazis and Balasis [85] point out that, "this political tactic was not strategically matched by a parallel concern regarding chronic high unemployment rates, extreme social segregation, and scanty housing". Even though a common goal for social housing is observed globally, each country has contributed to setting and developing policies commensurate with its capabilities and their way of defining social housing as well as the targeted groups in their societies. Additionally, different terminologies have also been used for social housing in most European Union countries.

The USA has followed a similar path in developing social housing policies over the centuries. Recently, it is also apparent that many countries have taken a more neo-liberal policy approach to involve many commercial and non-profit actors in providing social housing. Regardless of its success or not in delivering social housing, tangible changes

have developed over time. As for social housing providers, most countries directed social housing towards the market, especially in the European Union after World War II. Evolution and changes followed in these policies with new ideas such as co-production, rental housing, etc., and this has led to variation in the states' commitment to full or limited financing for social housing and enhanced involvements of community organisations. Similarly, many countries have applied new policies to reduce subsidies and to involve the private sector, as has happened in the USA.

The historical analysis further reveals a transformation in housing types and settlement patterns. In the 1930s and 1940s, the oil company contributed to the construction and planning as it was an American company in its early years, and most of its employees were American. Therefore, the development started with the cities close to oil wells designed as an American housing pattern, as shown in Figure 4. Later, the housing construction design evolved within the traditional Saudi style of a two-storey concrete dwelling, as shown in Figure 5. This residential architectural style has been prevailing up until now, but it has also been redeveloped and improved. Additionally, the multi-storey buildings still exist today and are similar to those in many countries, as shown in Figure 6.

On the contrary, there is a significant gap in developing social housing policies in the KSA compared to the global context. The social housing policy development in the KSA indicating the critical junctures is summarised across the global timeline in Figure 8. It was found that social housing in the KSA has evolved as a concept, although this term, per se, has not been used in the local context. In the last century, the state began to settle nomads after the unification of the kingdom. Then, financial support projects and public housing for employees started with the discovery of oil and economic prosperity between the 1930s and 1960s. In the 1970s and 1980s, developmental housing programs appeared as the first measure taken to house poor and low-income families and since then 'developmental housing' has been the most often used term to refer to the social housing concept. The government has mainly supported development housing in an inflexible manner, with a minor contribution by some charitable organisations to house the neediest groups at the onset of the new millennium. While housing support policies have evolved over time, it is only in the past few years that policies focus on delivering various programs to support families most in need of housing. In 2016, the urgent need to focus on housing the neediest groups were acknowledged and included in the Kingdom's Vision 2030. The KSA Vision 2030 has incorporated goals that seek various bodies' participation in developing developmental housing policies. Moreover, emphasis is also given to address any weaknesses that could undermine sustained support for the provision of developmental housing.

The historical timeline of the Saudi social housing policies progression reveals several critical junctures characterised by the central political act and resource dependency. The brief analysis of the historical context presented in the earlier sections demonstrates how emergency events have contributed to the development and changes in housing policy directions. The stages of social housing development demonstrate how the critical junctures led to policy change from a direct to an indirect housing approach before finally moving into the sustainable development lexicon through public–private partnership and a socially responsive policy framework.

5. Conclusions

KSA's Vision 2030 seeks to reform and continuously develop all aspects of development, most importantly the housing sector. In line with the vision, the government's strategic goal is to provide opportunities for Saudi families to own adequate housing. The vision requires the acceleration of steps in reforming and developing housing policy and keeping pace with housing demand through many programs and initiatives for all segments of society [38]. The state has sought to transform its role from a renter state to a welfare state. The welfare state, however, is widely believed to be unsustainable, especially if it depends on unstable oil incomes in a society with a young and rapidly growing population. The Vision 2030, therefore, seeks to accelerate the pace of economic

reform, which significantly aims to diversify other sources of income instead of solely relying on oil income. Successful economic diversification could, thus, create sustainability and continuity in addressing housing issues in the future.

Perhaps the most prominent reason for such reform is related to the increase in the budget deficit in the state [39]. Recently, revenues have fallen dramatically, sounding the alarm bell regarding the massive drop in world oil prices. The budget deficit increased and continued to fluctuate until the deficit reached SAR 297 billion in 2016 [92]. Nevertheless, with the adoption of the vision approved in 2016, economic reform has improved. Additionally, the state's income has diversified, and the dependence on oil incomes has declined. As a result of this vision, the deficit declined in recent years until reaching SAR 132.6 billion by 2019. Moreover, another driving force is associated with the increased number of expatriates and their families that have contributed to the large number of the non-Saudi population, estimated to be around one-third of the total population (around 37%) in 2016 [93,94]. Thus, the demand for housing by this demographic section impacts the housing market significantly at present and will continue to do so in the future. This rise in the population of expatriates has caused demand to exceed supply, causing an increase in rental rates and the consequent increase in the prices of land and residential units for sale.

Whilst in the past, the government attempted to resolve housing issues without seeking intervention from any other party, the Vision 2030 signals the government's adoption of a neo-liberal approach towards seeking multi-stakeholder partnerships. Since 2016, the state has been persistently working through building an integrated institutional response stepping beyond the traditional non-flexible policy environment. A collaborative approach stemming from the new vision has become an essential factor for continued economic sustainability in the state. Responding to the key objectives of Vision 2030, several initiatives and programs have been established under the supervision of the Ministry of Municipal and Rural Affairs and Housing. A major difference in the case of KSA, compared to most developing countries, is that while the government is beginning to pull back on public welfare expenditure in line with neoliberal thinking, it is still prepared to make substantial financial investments. This places the government in the position to determine the supervisory framework within which private sector and civil society groups could collaborate. The supervision includes oversight of legislative, organisational, administrative and financial aspects of the housing programs. Consequently, such supervisory arrangements could be workable as long as sufficient room is built in for other non-government actors to work within their specific protocols and frameworks as they collaborate to provide affordable and appropriate housing for the neediest sections of society. Moreover, building effective partnerships with the private sector, non-profit organisations, and charitable organisations will reflect positively on society and will ensure the long-term sustainability of services.

Finally, there are many lessons learned through which sustainability can be visualised in policies and understanding the best methods and theories of how policies are shaped and changed over time, namely, through the so-called critical junctures, and there are many lessons learned by reviewing much of the literature. In terms of sustainability, it is an effective method if used appropriately. One of the lessons learned is understanding sustainable solutions by supporting clear policies that are scalable and innovative. It is essential to educate and draw attention to highlight the importance and benefits of sustainability in social housing. Additionally, it is also better to know that policies should be aligned with innovative sustainable solutions and that the collective work of stakeholders enhances the understanding of future visions to achieve a commitment to sustainability for adequate social housing.

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Socio-Economic Drivers of Community Acceptance of Sustainable Social Housing: Evidence from Mumbai

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Abstract: The impact of socio-cultural outlooks on the acceptance of sustainability measures in a low-income context should be complemented by better understanding of socio-economic drivers to bridge the gaps between policy expectation and acceptance in social housing projects. The study attempts to explore the different aspects of well-being in determining the housing satisfaction of the residents of social housing under the slum rehabilitation schemes in Mumbai. Social housing offers considerably improved social and environmental sustainability components compared to slums; however, social acceptability remains low due to their location disadvantages. Using primary data collection from the sample of 298 households in Mumbai, the paper explores the varying levels of their housing satisfaction. The study found that economic opportunity is low in slum rehabilitation, mostly reflected in the job loss of the second earner, exacerbated by the change of work after shifting to social housing. Among other factors, location, accessibility of the building, household size and opportunity for social engagement play the most critical role in deciding the households' perceived housing satisfaction with social housing compared to slums.

Keywords: sustainability; social housing; community acceptance; housing affordability; housing accessibility; India

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1. Introduction

Housing is an essential aspect of sustainable development. Through its construction, design, use and demolition, housing contributes to the consumption of natural and man-made materials resources, water and energy [1]. As sustainable development is highly interlinked with the concept of quality of life, well-being and liveability [2], sustainability measures are increasingly at the forefront of housing provision efforts as housing is a significant tool to deliver both quality of life and sustainable development. The imperative of climate variability means that our housing technologies and design need to be more sustainable in reducing their contribution to greenhouse gas (GHG) emissions [3]. Sustainable housing is expected to improve energy efficiency, ensure access to safe drinking water, sanitation and hygiene, and reduce waste and water pollution. These structural and design elements of housing, alongside other housing components such as housing location, environment and expenditure burden, can, directly and indirectly, affect people's choices and chances to improve their quality of life.

In practice, sustainability is one of the neglected aspects of housing provision for the poor. The low-income housing sector has been unable to effectively adopt innovative technologies to improve housing sustainability and cost-effectiveness [4]. Moreover, despite the extensive efforts to make housing and infrastructure more sustainable, it remains to be seen to what extent sustainable housing contributes to the overall work of improving the poor's overall quality of life. The technological aspect of housing, aside from basic services (e.g., water and sanitation, waste management, heating and cooling), is yet to

be part of the social-economic system of housing policies. Social housing projects are not motivated by sustainability policy but by the need to improve economic indicators in the generation of housing stocks [5]. Whenever available, a critical issue facing the introduction of technological innovation in housing is that the selection of materials and quality of assembly does not always go hand-in-hand with reducing long-term operations and maintenance costs and minimising environmental impacts.

These gaps are further exacerbated by practical issues, such as the preferences and behaviours of the public toward sustainable housing remaining vague [6]. There are also challenges associated with low acceptance of the introduction of energy technology among low-income urban dwellers [7]. Lack of available sustainable housing indicators, especially targeting the poor, and little consideration for underlying socio-cultural causes are some of the main reasons for this drawback. Some housing indicators have captured economic, social and environmental sustainability [8,9], but these are very limited when applied to developing countries. In some cases where policymakers are motivated to deliver housing that meets the energy and financial needs of the poor, the implementation is often not well-planned, resulting in agendas framed by the assumption that the poor will readily accept the new technology [7]. Governments and developers also often assume that a new technology or approach's high general popularity should be a vital precursor for the acceptance of a specific project.

As part of efforts to overcome these issues, factors influencing community acceptance are increasingly recognised as essential to understanding the apparent contradictions between support for sustainable housing and the difficult realisation of low-income housing projects [10]. The concept of collective social influence is also argued to positively affect the socio-cultural acceptance of energy technologies amongst low-income urban dwellers in developing countries [7]. The impact of socio-cultural, socio-economic and socio-technological outlooks on the acceptance of sustainability measures in a low-income context merits further research and understanding to inform the policymaking process. In this article, we argue that the gaps between policy expectation and acceptance can be bridged by better understanding of the various socio-economic and socio-technological drivers of acceptance in social housing projects, complementing the socio-cultural dimensions. We use the concept of community acceptance, which forms the social acceptance approach when combined with socio-political and market acceptance. Community acceptance is one area of social acceptance that directly focuses on the user's end. Scholars have suggested linkages between user satisfaction and technology acceptance [11]. In the green building segment, residents are concerned about building performance, including economic, ecological and social benefits; their satisfaction with building performance affects their acceptance of green buildings [6]. Residents expect that green buildings outperform conventional counterparts in areas such as indoor environment quality, energy saving, comfort and satisfaction. Residents of social housing in India exhibit a similar vision prior to relocation; rehabilitation connotes an improved quality of life and provides satisfaction [12]. Existing literature also suggests that housing quality mediates the relationship between social housing and slums concerning the quality of life [13]. Building on this, community acceptance in our study refers to residents' acceptance of social housing with sustainability features, represented by their housing satisfaction with the overall quality of life in social housing after being relocated from slums. As such, this study relates the concept of community acceptance with the concept of residential satisfaction and quality of life applied to residential quality.

This article seeks to understand the key factors relevant to the quality-of-life influencing housing satisfaction of the residents of sustainable social housing in resettlement projects. Specifically, this article investigates the implementation of social housing equipped with energy efficiency design and waste management in their properties from residents' experience. Three social housing complexes in Mumbai, India, which resettled slum dwellers, are taken as a case to study different socio-economic and socio-technical/environmental factors that can foster or hinder housing satisfaction. Mumbai, located on the western coast, is India's largest metropolitan and commercial capital. The city has experienced

rapid population growth over the past 20 years attributed to migration from other regions. As a result, Mumbai has been burdened with low housing quality, pockets of slums and increasing demands for affordable housing. An estimated 9 million people live in slums, approximately 41.3 per cent of the total population of Greater Mumbai [14]. Slums have consistently proliferated despite several successive slum rehabilitation policies [15]. The slum rehabilitation process in Mumbai and its outcomes have been the centre of multiple studies, looking at various approaches; policymaking [15,16], gender and energy [17] and building performance [18], to mention a few. Several studies focusing on residential occupant behaviour and perception of technology exist in the current literature, with a particular focus on indoor air quality and thermal comfort [19–22]. While these studies agree that economic and socio-cultural context plays a pivotal role in technology acceptance, most address the acceptance of sustainable social housing in a fragmented way, either through a socio-economic or socio-technical methodology. Specific studies on overall social acceptance in the affordable housing segment remain underexplored and need concentrated attention.

This article adopts a community acceptance perspective (through residents' housing satisfaction) on economic and non-economic determinants of household practices in social housing in Mumbai. Economic and non-economic determinants were carefully selected from existing indicators relevant to sustainable housing, green building and affordable housing to represent the socio-economic and socio-technological context of sustainable social housing. The analysis result is intended as an intervention that informs evidence-based policy and academic debate on a better understanding of facilitating socio-economic factors and barriers linking sustainable housing delivery and community acceptance. By identifying the different aspects of well-being determining residents' housing satisfaction, this article makes a case for reframing discussions on community acceptance of sustainable social housing projects under the slums rehabilitation schemes in Mumbai to fill the gap of evidence on transitions to sustainable urban resettlement.

Following this introduction, the article is organised as follows. The next section (Section 2) reviews the community acceptance of sustainable housing literature, followed by an overview of Indian sustainable and affordable housing development, slum rehabilitation and social housing policies in Mumbai. Section 3 presents the methodology and identifies the empirical strategy. Section 4 has the empirical results, while Section 5 provides discussions based on the results and descriptive data analysis. The broad conclusions and implications of the study are presented in the final section.

2. Literature Review

2.1. Community Acceptance of Sustainable Housing

Community acceptance is one of the three dimensions of social acceptance, along with socio-political and market acceptance. It refers to the specific acceptance of decisions and projects by local stakeholders, particularly residents and local authorities [23]. Community acceptance through public participation can be operationalised as procedural justice in project planning [24]. Social processes with residents' engagement and participation in the life cycle of the green building show a dynamic trend, which can improve residents' happiness and productivity [6]. In social housing projects, the degree of public involvement can be measured through residents' participation in planning, design, operation and maintenance. Such public involvement could range from one-way communication through information sharing to active involvement in decision-making. In practice, public participation in the planning and designing of social housing is highly limited. None of the slum rehabilitation schemes being implemented in Mumbai so far mentioned any kind of participation from the slum dwellers [16].

A key factor for the acceptance of sustainable housing is a consideration of economic and non-economic determinants, which include environmental effects, technology-oriented aspects and user-focused aspects [6]. The introduction of new technology in housing means users' economic viability, such as housing expenditure and household income informality,

can influence residents' perception of the technology installed. Social and humanistic needs interplay with economic consideration and create a dynamic role in the life cycle of green buildings [6]. As such, social processes involving resident engagement and participation need to be considered in all stages of buildings, from the conceptual and development stages to operation and maintenance in order to prevent design failures and advance the users' quality of life [6,25]. This means when a local government or a housing project developer introduces various technologies in developing sustainable housing projects, residents' acceptance becomes relevant in implementation decisions and ideally should be included in the decision-making process.

Acknowledging the need for broader understanding of residents, social acceptance scholars have proposed examining social acceptance of different new technologies in a less exhaustive but comprehensive approach by establishing a survey organised to accurately identify the needs, wishes, preferences and expectations of the residents. For example, Yuan et al. [26] identified the role of income, age and education of residents in the level of awareness of solar energy technologies and their decision to implement them. With the introduction of vertical farming in housing, perceived benefit, risk, location, demographic characteristics, value and belief, trust, fairness and knowledge are recognised as crucial determinants influencing community acceptance [27]. These studies suggest that resident perceptions can influence the success of the technology installation project in housing projects. In turn, there is a positive effect if projects advance and they can utilise the technology well. Hence, community acceptance can become a catalyst that encourages sustainable lifestyles and, in a broader scope, steer cities toward more sustainable consumption [28].

Despite the interest in advanced studies on social acceptance in the housing sector, considerations related to community acceptance are seen as desirable but are rarely included in projects developing novel building systems [25]. Among the available studies, even less available are those looking at community acceptance of new technologies implemented in social housing [29,30]. Energy efficiency received the most interest in existing research addressing the introduction of new technology in social housing. In this setting, studies have argued that inherent barriers and success factors are embedded within the relationship between the housing provider and low-income residents during the installation of new technologies [31].

Systematic research on factors affecting community acceptance is scant, and it is challenging to recognise divergences between relevant drivers in diverse socio-cultural and political contexts [32]. As a result, community acceptance should be viewed according to specific sectors and disciplines [27]. In the housing sector, community acceptance is shaped by factors associated with the information made available to users, public involvement in the projects, residents' trust in developers during the project development, and the anticipation of projects, including risks and benefits [33]. In cases where the installation of new technologies in social housing is decided by governmental policy instead of a decision by the residents, efforts are needed to inform and involve them regarding the benefits of technologies to avoid abandonment and replacement [29]. Additionally, since introducing new technologies in housing affects many stakeholders differently depending on various contexts, greater understanding of socio-economic and socio-cultural determinants of different technologies across different localities is needed. Research suggests that introducing technology which requires extensive awareness from residents, such as solar panel installation, involves capacity building and awareness-raising for residents during the pre- and post-design stage. In introducing technology that entails alteration of building façades, such as solar PV and vertical farming, the research argued that attitudes towards the technology and its application and perception of aesthetics are also important factors affecting acceptance [25]. Developers play an important role in raising residents' awareness and ensuring necessary information is available. However, developers also often lack awareness and information on the technologies introduced in the implementation.

Aside from the information and physical features of housing and technology offered, accessibility of economic opportunities and affordability are key factors linked to the accep-

tance of sustainable housing. The increased focus on the sustainability of housing does not necessarily go hand-in-hand with affordability; using traditional design and construction methods has led to poor cost-effectiveness of sustainable, affordable housing [10]. Affordability, forming the basic economic unit of human settlement in the built environment, is a crucial component of housing research focusing on the poor. As socio-environmental sustainability is closely linked to economic sustainability, studies have pointed out that financial assistance often fails to help the poor meet their housing needs as the affordability of a household depends on its command of the various resources required for housing [34]. The households' actual and potential savings are the most important financial resources, and employment or income generation enables the poor to afford a dwelling and maintain it [35]. The housing sector is employment-intensive during its life cycle, construction and proper maintenance [36]. The affordability of housing, thus, should be seen beyond rent and as an integral part of economic sustainability, which strengthens the economic self-reliance of the household, especially for the poor [34].

2.2. Development of Indian Sustainable and Affordable Housing

The concept of sustainable housing that incorporates green technologies and designs is still emerging in India. In 2013 (later updated in 2016), a new Part 11 was added to the National Building Code of India to cover the parameters required to be considered for planning, design, construction, operation and maintenance of building and land development from the point of sustainability. Despite the housing sector having adopted creditworthiness for environmental protection, work on sustainable housing has been largely limited to standalone projects catering to upper-middle and high-income populations. A large section of the Indian population is unaware of green building practices [37]. Regardless, sustainable and affordable housing has gained importance in India. Indian Green Building Council (IGBC) has launched the green affordable housing rating system providing no or minimal additional cost to the developer or the residents. It is a voluntary, consensus-based and market-driven rating system by an independent third party that received incentives from several Central and State Government agencies to promote the green building movement. There is also a promising trend where developers are showing interest in investing in housing for low-income groups in cities where demand for high-income groups is in a semi-saturated state [38]. An example of a successful case is the passive solar housing using passive thermal heating in the Kargil district, which reduces the fuel consumption needed for indoor heating by up to 60 per cent [39].

The main reason behind adopting green technologies in the Indian housing sector is energy conservation, including reducing utility bills [40]. India has a lesser record in implementing prefab technology with sustainable industrial byproducts and insulation materials in its housing projects [41]. Hence, sustainable housing measures primarily focus on energy- and water-saving technologies and design, waste management and healthier spaces for residents. These measures align with the Leadership in Energy and Environmental Design (LEED) and Green Rating for Integrated Habitat Assessment (GRIHA) rating systems as well as the recent national focus on energy and resource efficiency. The latest Energy Conservation in Building Construction enacted in 2017 is also a positive step toward expanding the current energy conservation practices for the construction and operation of housing. However, more efforts are needed to link energy conservation practices with the built environment, contributing to healthy living space and overall comfort. A behavioural study in slum rehabilitation housing has revealed that slum dwellers who moved to social housing perceived that such housing suffers from lack of comfort levels and indoor air quality [13]. Lack of ventilation and fresh exchanges lead to relocated dwellers seeking more healthcare visits [42], establishing a critical link between the quality of the built environment and health outcomes in affordable housing [19].

Mitigating built-environment-related discomfort can improve energy conservation practices and the sustainability of low-income housing. The design of the low-income social housing often exaggerates residents' discomfort due to incompatible common at-

titudes and practices. For example, windows designed to regulate thermal comfort may not properly function as residents keep windows closed to prevent burglary, dust and insects. The previous study has pointed out that the lack of basic literacy, education and levels of empowerment of the community affected residents' capability and mentality to maintain and operate the building in Indian affordable housing as the designers would have expected [43]. Households' adaptive actions such as window opening, energy knowledge related to electricity-related expenditure, and energy habits in operating household devices are observed as important variables influencing actions within low-income social housing in Mumbai [18]. Energy and water access and housing design also affect women's practices indoors (e.g., cleaning, cooking and childrearing), creating undesirable impacts such as higher energy intensity, reduced social interaction and loss of women's social capital [17]. Understanding the local socio-cultural contexts, which influence household practices, attitudes and emotions, becomes critical for the success of sustainable and affordable housing projects [19]. Developing low-income housing aimed at comprehensively and concurrently achieving a higher quality of life and well-being with the introduction of new building technology and designs needs to facilitate adaptive actions based on socio-cultural characteristics.

The urban housing shortage is estimated to be around 18.78 million in 2012, with 96 per cent of it skewed towards the poor [44]. Transition to sustainable housing thus is greatly needed for the housing sector to contribute significantly to the GHG reduction. However, research pointed out that housing and resource-efficiency objectives are not being pursued concurrently. The broad themes or rationales of India's main policy instrument on housing and the urban sector focus extensively on affordability and quantity rather than sustainable social housing [39]. Despite the inherent connection between housing and well-being, slum rehabilitation and low-income housing guidelines are missing sustainability elements such as energy conservation and sustainable healthy community in housing and built-environment plans. Housing units under the slum rehabilitation policy in Mumbai, for instance, are restricted to an area of 25 square meters (approximately 269 square feet) with no basic guidelines for energy efficiency or building design [42]. Housing policies such as Rajiv Awas Yojana or Pradhan Mantri Awas Yojana also have not made sufficient linkages with the environmental policies and commitment at the national level. As observed in Mumbai, this lack of sustainability guidelines in affordable housing is aggravated by insufficient planning tools and methodologies available to the city planning departments [45]. Recent government-led climate change adaptation and mitigation missions could offer synergies with the housing sector. For example, the National Mission on Sustainable Habitat (NMSH) 2010 covers climate change adaptation through the betterment of housing and infrastructure related to water, sanitation and energy, among many. Since there is no information on the level to which NMSH is resourced, it remains unclear how this mission could lead to better implementation of sustainable housing in India and those for the poor in particular.

Existing climate change adaptation actions in Indian cities focus greatly on building local capacity and are primarily project-based and reactive with limited consideration of long-term climate risks [46]. Actions such as solar-powered buildings and cool-roofs (e.g., Ahmedabad, Hyderabad) are small interventions as part of smart city projects. With the challenges associated with affordable housing and slum rehabilitation, climate change adaptation policies for the housing sector remain a blind spot in the current housing policies. Addressing the affordable housing challenges and specific socio-cultural characteristics of the low-income population would require a deeper involvement of socio-architectural elements in the design process [45]. The ultimate goal of sustainable and affordable housing should go beyond conserving resources by introducing technology to improve the quality of life. Hence, climate change adaptation in the housing sector, including through the introduction of new technology, needs to take into account factors affecting the quality of life of the residents and the economic burden of health and adaptation costs at the household level.

2.3. Slum Rehabilitation and Social Housing Policies in Mumbai

In the Indian context, the term affordable housing is more common and is used interchangeably with social housing [39]. While in other countries, social housing covers all housing that receives some form of government support or assistance, in India, it refers to affordable housing regardless of the providers. Social housing in India, thus, includes affordable housing provided by the private sector, cooperatives, community groups, non-profit private firms and political organisations. The government, however, remains the main provider of low-income social housing, i.e., housing for the Economically Weaker Section (EWS) and Low-Income Group (LIG). The government also defines affordability as a ratio of housing expenditure to annual household income.

Given the challenges in providing housing, a number of policies have been enacted at the national level. Aiming to make India slum-free, the pilot phase of Rajiv Awas Yojana was launched in 2011. The scheme has a progressive architecture that includes in situ rehabilitation of slums and legislation to provide property rights to slum dwellers. The twelfth FYP said that urbanisation should be guided towards inclusive, equitable and sustainable growth of towns and cities with proper civic amenities. Good urbanisation would ensure that towns and cities are free from slums and provide adequate employment opportunities and a decent quality of life to all their inhabitants, including the poor. The plan recognised that the private sector's supply of decent, affordable housing has remained woefully inadequate. A multi-pronged strategy is required to meet the need for housing for the urban poor.

The most recent initiative by the central government is the Housing for All 2022 or Pradhan Mantri Awas Yojana (Urban) (PMAY (U)) scheme. Under this scheme, around 20 million urban houses have to be constructed in India by 2022. In March 2022, the scheme recorded 5.635 million houses completed, 11.544 million houses sanctioned and 9.518 million houses grounded [47]. A key aspect to the success of this programme is slum rehabilitation, a long-standing government strategy to provide housing for the poor. The current scheme can be traced back to the beginning of the 1990s when the state government formulated a new Slum Rehabilitation Scheme (SRS), preceded by a succession of programmes and policies beginning in 1956. It is worth noting that the year 1991 marked the start of the privatisation of slum rehabilitation in India. Under this SRS, slums can be redeveloped, and as an incentive to those conducting the redevelopment, permission could be granted for extra building space. By providing the developer with extra building space that can be sold on the open market, accommodation for slum dwellers would be cross-subsidised. For the state government, this arrangement is aimed at fulfilling its obligation to the "Housing for All 2022" scheme [16]. The private housing and construction industry was expected to contribute significantly to this programme. Guidelines spelt out the profit limit (25 per cent) and the extent of the incentive (based on the Floor Space Index (FSI)). A group headed by the municipal commissioner had to approve each proposal, but the programme did not take off in any significant way. Critics pointed out that the scheme needed better regulatory guidance [48] and that it was driven by the private developers' interest instead of serving the interest of the slum population [16].

The security of tenure is indispensable when addressing slum rehabilitation and delivering successful social housing measures. However, the security of tenure was not considered to be an important parameter when declaring any area as a slum by the Slum Act, Census or National Sample Survey Organisation (NSSO). Across the states in India, including in Mumbai, the concept, perception and definition are different, depending on the socio-economic conditions. This leads to discrepancies between the parameters adopted by State Governments, the Registrar General of India (RGI) and NSSO. In Mumbai, according to the Maharashtra Slum Areas (Improvement, Clearance & Redevelopment) Act, 1971, any area can be declared as a slum area by the district collector if the area is or can be a source of danger to the health, safety or convenience of the public of that area or its neighbourhood. Having inadequate or no basic amenities or being unsanitary, squalid, overcrowded or otherwise is considered detrimental to the public's health, safety

or convenience in that area. An area can also be declared a slum if the buildings used or intended to be used for human habitation are unfit for human habitation due to various reasons such as dilapidation, overcrowding, faulty arrangement and design of such buildings, narrowness or faulty arrangement of streets, lack of ventilation, light or sanitation facilities or any combination of these factors. The following conditions should be fulfilled to decide whether the buildings are unfit: (a) repairs; (b) stability; (c) freedom from damp; (d) natural light and air; (e) provision for water supply; (f) provision for drainage and sanitary conveniences; (g) facilities for the disposal of wastewater.

3. Data and Research Methodology

3.1. Description of the Study Area

This study was conducted in Mumbai, India and targeted social housing accommodating relocation from slums and squatter settlements. Social housing locations were selected based on their sustainability features, building age, distance from the previous living area for most of its residents, and proximity to the city centre, commercial districts, industrial sites and basic urban services such as schools, hospitals, markets and parks. The three social housing complexes selected are located in Shivneri, Santacruz and Bhoiwada. As in other more recent housing projects, eco-housing criteria were applied during the project's implementation. This includes the biodiversity conservation method for eco-housing during the site planning process, environmental architecture through adopting climate-responsive design practices to achieve thermal comfort and cross-ventilation and reduce glare, energy conservation and management with the use of fluorescent lamps, efficient building materials for finishing materials, water conservation and waste segregation facilities.

3.2. Study Design

This paper focuses on the third component of social acceptance, i.e., community acceptance. Here in this paper, it is measured as household-level acceptance of sustainable housing through residential satisfaction—Quality of Life (QoL). Residential satisfaction and the willingness to pay are common determinants in studies related to public acceptance of new technology instalments in the housing sector [6,49]. Within psycho-social study, the term quality of life is frequently used interchangeably with subjective well-being, satisfaction or happiness, depending on the specific field in question [50]. Subjective well-being, in particular, concerns how people evaluate their lives, including in the form of conscious evaluative judgements about specific aspects [51]. Moreover, quality of life is a multidimensional phenomenon linked to economic, socio-cultural, psychological and environmental studies. One of the important issues to consider is that quality of life measures relate to the interaction between people and their environment [52].

Perceived benefit perception affects the level of acceptance, along with perceived risks, values and beliefs, location, public awareness, demographic characteristics, perceived trust and fairness [27]. Different studies used different factors to measure acceptance depending on specific socio-cultural and political contexts. Our variables to measure acceptance of sustainable housing were developed from sustainable housing indicators [34,53], a model of housing quality determinants for affordable housing [54,55] and green building assessment tools (BREEAM, IISBE, USGBC). In identifying the distribution of economic and social gains, this research included the attributes of well-being, employment, affordability and accessibility. The study expects variations across all three variables (i.e., economic efficiency, social opportunity, environmental protection) affecting the acceptance of sustainable housing. The questionnaire was designed with closed-ended questions of 5 pointers Likert scale for the perception-based questions to reduce doubt, increase consistency and understand the outlook of a parameter across the respondents. The direct entry option was used for questions where amounts are used (e.g., frequency, income, hours, etc.) to alleviate the specificity and ordinality problem. In order to maintain the cross-validation of subjective responses, the questionnaire was supplemented with open-ended questions that two authors

independently analysed to come to a joint conclusion about the perceived improved quality of life (residential satisfaction). Figure 1 illustrates the community acceptance model.

1. Environmental protection/Resource efficiency: Resource efficiency (energy use) in terms of electricity required for lighting and cooling is an essential determinant of residential satisfaction.
2. Economic efficiency: Time taken (distance) in commuting for work does not affect residential satisfaction; housing design and location of the housing complex (to the commercial district) are essential factors influencing residential satisfaction; sustainable social housing can benefit local populations through employment and job creation, given that inhabitants are relocated in situ.
3. Social satisfaction: Involvement in decision-making does not necessarily translate to satisfaction over the process (participation can be made compulsory, peer pressure); the positive attitude towards community participation (self-initiative and level of satisfaction over the process) affects acceptance towards resource efficiency measures implemented through community-based planning.

Figure 1. Community acceptance model of sustainable housing at the household level.

The following logit regression model (Equation (1)) is applied to analyse the determinant of community acceptance of social housing measured as improvement in a perceived improvement in quality of life (QoL). The explanatory variables used in the model are building location, i.e., proximity to the city centre, demographic, i.e., gender of the household head, household size, and socio-economic characteristics of the household, i.e., income class. Community acceptance plays a role in accepting or rejecting innovations, and location (geographical location, place attachment) can specifically facilitate or impede acceptance in low-income communities [56,57]. Demographic characteristics have been demonstrated to affect people's perception as they relate to socio-economic features, living circumstances, and personal knowledge, experience and worldviews [49]. The extant literature findings suggest that occupant behaviour of slum rehabilitation housing in Mumbai is influenced by socio-demographic characteristics, behavioural adaptation and lifestyle practices (energy habits, appliance usage, clothing adaptation) [58]. Socio-economic characteristics of the households are considered a determiner of our perceptions and behaviour toward environmental attitudes [59]. A behavioural study of residents from slum rehabilitation housing provides valuable insights into the occupant behaviour diversity in energy use and perceived comfort within a similar socio-economic structure [18].

The model also includes subjective residential satisfaction in terms of cost of living, perceived social satisfaction in regard to social engagements, and income opportunities in the present house compared to the previous house of the household. These three independent variables cover the perceived benefit perception of socio-economic (economic efficiency and social engagement) and socio-technological (environmental protection) determinants of community acceptance (Figure 1). The general expectation is that people expect socio-economic benefits to be significantly positive for societies in the context of new technology installations in developing countries [32].

$$\begin{aligned}\Pr(\text{community acceptance} = 1) \\ = \beta 0 + \beta 1 \text{ Housing location} + \beta 2\text{j Demographic Characteristics} \\ + \beta 3\text{k Socioeconomic Characteristics} + \beta 4 \text{ Living expenses} \\ + \beta 5 \text{ Economic opportunity} + \beta 6 \text{ Social engagements} + \varepsilon\end{aligned} \quad (1)$$

In the model, community acceptance takes the value "1" if there is an improvement reported in QoL compared to its previous house. This construct corresponds to our view of residential satisfaction—QoL as the response of housing location, demographic characteristics (age and gender of household head), socio-economic characteristics (household size), living expenses, economic opportunity (accessibility of the building) and social engagements as predictors. Except for the household size, all other variables are categorical in nature. The community acceptance takes the value "0" otherwise. The number of samples collected is 298 respondents. The summary statistics and ANOVA of the variables used in the regression analysis are reported in Tables A1 and A2, respectively.

4. Results

4.1. Empirical Result: Perceived Residential Satisfaction

Table 1 presents the results of the factors influencing the perceived quality of life and thus the community acceptance of the houses in the sample housing complexes. Starting with household characteristics, we find that gender has no significant impact on the community acceptance of the social housing in our sample. This insignificant outcome of gender could likely be because of the small sample. Larger households tend to have more acceptance of social housing. However, the interaction of household size with building location has lower housing acceptance (Shivneri and Santacruz). The larger households in Shivneri and Santacruz locations have lower residential satisfaction than the residents of Bhoiwada. This might be because of the small floor area of the houses. Before 2019, SRA had only 25 square meters of houses to offer as slum rehabilitation housing. In 2019, they marginally increased their floor area to 30 square meters (approximately 322 square feet). The average household size is around 4.5 members in our sample; 25 square meters is slightly too tight for a family of 5. Higher-income classes tend to have higher acceptance of the public houses in our sample. This may be because they have enough resources to modify the layout of the flats according to their requirements and can afford better amenities to derive maximum comfort from the houses.

Households' living expenses, which are used as a proxy for resource efficiency and cost of living because they majorly comprise consumption expenditures (food, water, electricity etc.) compared to their earlier residence, are surprisingly negative and insignificant. Improvement in the accessibility of the building, which is a proxy for economic opportunity, tends to be reflected in higher acceptance of social housing. The other important variable affecting the likelihood of higher social acceptance is the opportunities for higher social engagements. The households who reported a decrease in social engagements in the current residence compared to their earlier residence are less likely to report higher residential satisfaction. Location is a crucial determinant of residential satisfaction. Households living in dwellings closer to the city centre reported higher acceptance of social housing.

Table 1. Logit estimates of factors determining residential satisfaction in Mumbai.

Independent Variables	Coefficient
Economic opportunity/accessibility of the building (deterioration as the base)	
Same as before	0.0486
	(0.335)
Improvement	0.619 ***
	(0.121)
Living expenses (decreased expenses as the base)	
Same as before	0.131
	(0.664)
Increased	−0.0849
	(0.220)
Social engagements (increased as the base)	
Same as before	−0.0364
	(0.669)
Reduced	−1.297 ***
	(0.468)
Housing location (Shivneri as the base)	
Santacruz	−0.959 ***
	(0.286)
Bhoiwada	−1.343 ***
	(0.109)
Age of the household head	−0.00452
	(0.00377)
Household Head Male	0.0397
	(0.493)
Household Size	0.134 ***
	(0.0205)
Frequency of Garbage Collection	−0.0727
	(0.109)
Interaction [household Size and Shivneri]	−0.0882 ***
	(0.00158)
Interaction [household Size and Santacruz]	−0.0987 ***
	(0.0296)
Constant	2.257 ***
	(0.580)
Observations	298
Robust standard errors in parentheses	
Dependent variable: Community acceptance	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.2. Hosmer and Lemeshow's Test, Goodness-of-Fit

We use Hosmer and Lemeshow's test to test the goodness-of-fit of our model. In Hosmer and Lemeshow's goodness-of-fit test, the predicted frequency and observed frequency should match closely, and the more closely they match, the better the fit. The Hosmer–Lemeshow goodness-of-fit statistic is computed as the Pearson chi-square from the contingency table of observed and expected frequencies (Table 2). A good fit, as measured by Hosmer and Lemeshow's test, will yield a large p-value. With a p-value of 0.61, we can say that Hosmer and Lemeshow's goodness-of-fit test indicates that our model fits the data well. For sample sizes (n) up to 1000, the currently used standard with the number of groups (g) is 10. Ideally, $g > P + 1$, where P is the number of covariates (7 in our model). With the choice of $g = 10$, the power of Hosmer and Lemeshow's test is reasonably small (30–40 per cent), whereas higher power exhibits a moderate lack of fit [60].

Table 2. Hosmer and Lemeshow's test, goodness-of-fit.

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.7199	17	18.8	13	11.2	30
2	0.7471	22	22.1	8	7.9	30
3	0.7686	27	22.8	3	7.2	30
4	0.7902	22	23.3	8	6.7	30
5	0.8260	23	23.5	6	5.5	29
6	0.8485	27	25.2	3	4.8	30
7	0.8732	24	25.9	6	4.1	30
8	0.8929	27	26.5	3	3.5	30
9	0.9099	26	27.0	4	3.0	30
10	0.9504	27	26.9	2	2.1	29

Number of observations (n) = 298
Number of groups (g) = 10
Hosmer–Lemeshow chi2(8) = 6.37
Prob > chi2 = 0.6054

Note: Table collapsed on quantiles of estimated probabilities.

5. Discussion

5.1. Housing Characteristics and Economic Opportunities

All the slums in Mumbai do not consist only of residential areas; they also include commercial uses such as shops and small-scale industries [61]. With most slum inhabitants working and earning their income close to their accommodation, any housing-led urban regeneration through slum rehabilitation should consider location as one of the main factors that could create a trade-off for social housing affordability. Table 3 shows that relocation affects changes in the primary source of income in all three examples of social housing observed. More than 50 per cent of households report changes in work, including changes in the type of work or location of work. Further observation is required to understand whether these changes in the households' primary source of income caused by resettlement positively or negatively affect the overall economic structure of the households, including an increase in work opportunities and monthly income. Housing-led urban rehabilitation will not be sustainable in the long term if people living in the slums, whether they are long-term residents or newcomers, are relocated far away from their source of income and employment opportunities.

Table 3. Percentage of households reporting changes in work (the primary source of income) after shifting to their current location.

	No Change	Change in Type of Work	Change in Location of Work
Shivneri	45.45	48.48	6.06
Santacruz	54.46	41.58	3.96
Bhoiwada	47.96	30.61	21.43

5.2. Housing Quality and Facilities

Literature pointed out that, in general, housing quality in the social housing and resettlement area is significantly increased when compared to the slums [61]. Improvements are observed in the amount of daylight, ventilation and privacy received; there is also a considerable increase in the available number of basic amenities such as toilets, parking and open space. In general, social housing built for resettlement has better access to basic municipal services than slums, such as water, sanitation, waste collection, storm drainage, street lighting and emergency access. Table 4 shows households' satisfaction regarding housing quality and well-being, comparing their experience living in the slums and after relocating to social housing.

Table 4. Percentage of households reporting housing quality and facilities compared to previous residences.

	Waste Management	Cleanliness	Safety	Lift	Passage	Terrace
No change	23.67	17.67	12.67	N/A	N/A	N/A
Improved	74.00	82.00	86.67	89.33	64.33	29.00
Worsened	2.33	0.33	0.67	10.67	35.67	71.00

Note: Not available (N/A).

When we studied waste management, the following interesting facts came into the picture. Across the observed social housing, 64 per cent mentioned that shared outdoor passageways have improved, while the rest considered them to be worse than what they used to have in the slums. This means resettlement and rehabilitation do not always respond to the socio-cultural aspects to a great extent. Social housing constructed under the housing-led urban regeneration scheme is functional and practical. Still, providing public spaces such as passages, while well-built, is not conducive to active social life. In slums, the passage in front of the houses functions as a space of interaction due to the proximity and the multi-functionality of the space. In social housing, such interaction is less generated because of the single-functionality and design of the passage. Dwellers can be further isolated from their surroundings and have less attachment to outside space.

6. Conclusions

The study attempts to explore the different aspects of well-being in determining the housing satisfaction of the residents of social housing under the slum rehabilitation schemes in Mumbai. The findings show that an array of attributes attached to social and environmental factors, income generation and infrastructure influences the household's overall housing satisfaction. The study found that economic opportunity is low in the slum rehabilitation, mostly reflected in the job loss of the second earner, exacerbated by the change of work after shifting to social housing. In our case study, location plays the most critical role in deciding the households' satisfaction regarding the affordability of social housing compared to slums. Therefore, to achieve considerable economic sustainability in the slum rehabilitation project, in situ development of slums should be promoted.

The implications of our findings are that sustainable social housing under the slum rehabilitation scheme needs to address the issues relevant to the built environment and housing amenities. Social housing offers considerably improved social and environmental sustainability components compared to slums. Households' perception of their overall well-being by living in social housing is high in terms of the built environment and housing amenities. The analysis shows that physical features greatly affect dwellers' satisfaction with social housing. In this study, we argue that while the built environment and housing amenities have greatly improved, they are still lacking in accommodating the socio-cultural aspects and higher economic opportunities of all the household members. Leverage effects of socio-cultural aspects on community acceptance vis-a-vis housing satisfaction should be more effectively harnessed with supporting measures, especially with regard to social satisfaction. This includes improving design adaptability that accommodates social interaction such as shared spaces, i.e., passages and quasi-open spaces (terraces). Future studies need to include essential housing characteristics, such as the residents' specific preferences for visualisation aspects and the broader context they live in, i.e., characteristics of quality neighbourhoods. The determinants from our community acceptance model can be expanded and contextualised to social housing projects, especially in cities in developing countries.

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Data Availability Statement: The data presented in this article are available on request from the corresponding author. The data are not publicly available due to the sensitivity of the data.

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Appendix A

Table A1. Summary statistics.

Variable	Mean	Std. Dev.	Min	Max
Community acceptance	0.813	-	0	1
Accessibility of the building				
Deteriorated	0.407	-	0	1
Remain same	0.357	-	0	1
Improved	0.237	-	0	1
Living expenses				
Reduced	0.253	-	0	1
Same	0.320	-	0	1
Increased	0.007	-	0	1
Community engagement				
Improved	0.343	-	0	1
Same	0.610	-	0	1
Reduced	0.047	-	0	1
Location				
Shivneri	0.330	-	0	1
Santacruz	0.333	-	0	1
Bhoiwada	0.333	-	0	1
Age	48.237	11.632	24	80
Household Head Male	0.843	-	0	1
Household Size	5.527	2.410	1	18
Frequency of Garbage Collection in a week	2.743	1.570	1	6

Table A2. Analysis of variance (ANOVA).

Source	Partial SS	df	MS	F	Prob > F
Model	3.018791	17	0.177576	1.18	0.2821
Accessibility of the building	0.381415	2	0.190707	1.26	0.284
Living expenses	0.098057	3	0.032686	0.22	0.8848
Community engagement	0.681001	2	0.3405	2.26	0.1065
Age	0.039067	1	0.039067	0.26	0.6112
Location	1.303549	2	0.651774	4.32	0.0142
Household Head Male	2.58×10^{-5}	1	2.58×10^{-5}	0	0.9896
HH size	0.167432	1	0.167432	1.11	0.2929
Garbage collection (frequency)	0.565037	5	0.113007	0.75	0.5872
Residual	42.52788	282	0.150808		
Total	45.54667	299	0.15233		
Number of observations = 300 Adjusted R-square = 0.0100					

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